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1881.

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## ERRATA.

Page 274, line 21 from the bottom, *for* PETASCELISCA *read* PETASCELIS.

„ 276, „ 19 from the top, *for* *Petasceliscia* *read* *Petascelis*.

„ 582, „ 12 from the top, *for* Plate LI. *read* Plate LII.

„ 602, „ 9 from the top, *for* THALACROCORAX *read* PHALACROCORAX.

„ 746, „ 7 from the bottom, *for* *inornatus* *read* *dorsalis*.

„ 925, „ 22 from the bottom, *for* SCOBICULARIA *read* SCOBICULARIA.

Plate VI. fig. 4. The mouth of *Lepralia appressa*, var. *vinosa* is incorrectly represented; the description, p. 51, is correct.



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PROCEEDINGS  
OF THE  
SCIENTIFIC MEETINGS  
OF THE  
ZOOLOGICAL SOCIETY  
OF LONDON  
FOR THE YEAR  
1881.  
(PLATES.)

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# PROCEEDINGS

OF THE

## SCIENTIFIC MEETINGS

OF THE

### ZOOLOGICAL SOCIETY OF LONDON.

---

January 4, 1881.

Professor Flower, LL.D., F.R.S., President, in the Chair.

Mr. Selater exhibited a skin of the Southern Merganser (*Mergus australis*, Hombr. et Jacq. Voy. au Pôle Sud, Zool. iii. p. 152, Atlas, t. 31. fig. 2), from the Auckland Islands, belonging to the collection of Baron Anatole von Hügel.

Baron A. von Hügel had obtained two examples of this very scarce bird from the Auckland Islands when in New Zealand in 1875, and had presented one of them to the British Museum. The other was now exhibited. The acquisition of these birds had been already recorded by Baron A. von Hügel in the Ibis for 1875 (p. 392), but had been overlooked by Mr. Selater in his recent paper on the Anatidæ (P. Z. S. 1880, p. 513).

Mr. Selater observed that, though the colouring of the plate in the 'Voyage au Pôle Sud' seemed rather too bright, there could be no question, he thought, of Baron A. Von Hügel's bird being referable to the same species. *Mergus australis* appeared to come nearest to *Mergus brasiliensis*, as already indicated by Hombron and Pucheran, but differed in its brown head, the longitudinal (not transverse) markings below, and longer bill. As regards the form of the tail, commented on by Hombron and Pucheran, there seemed to be little difference between the two species.

---

Prof. Newton, M.A., F.R.S., exhibiting, on behalf of Prof. Alphonse Milne-Edwards, For. Mem. Z. S., an egg of *Cariama cristata*, remarked:—

"This rare egg was lately sent to me by M. Alphonse Milne-Edwards, that I might exhibit it to the Society. He writes to me:— 'L'œuf de *Cariama* dont je vous ai parlé a été pondu à la Ménagerie au Muséum cet été. La ponte est de 2 œufs. Le mâle et la femelle couvent successivement. Une éclosion a eu lieu au bout de 29 jours.

Le jeune était couvert de duvet gris, relevé de taches d'un brun foncé. Malheureusement il a été mangé par le père, et les observations n'ont pu être continuées.

"The egg unfortunately arrived broken. It is white, very sparsely blotched with reddish-brown, a few of the markings taking the form of irregular hair-like lines, and measures 2.24 by 1.62 in. Thienemann, in his 'Fortpflanzungsgeschichte der gesammten Vögel,' has figured what he professes to call a specimen of this egg (tab. lxxii. fig. 1-4); but, as is well known, the letterpress of that work is incomplete, and no one can say whether the specimen was genuine. In like manner M. des Murs, in his 'Oologie Ornithologique,' has described the egg of this species (p. 368); but, again, evidence as to the authenticity of the specimen is not forthcoming. On the receipt of this egg from M. Milne-Edwards, I at once bethought me of an egg which had long been known to me as existing in the collection of Mr. H. F. Walter F.Z.S.; and that gentleman has been so kind as to send it to me for exhibition to-night. This specimen is considerably larger than that laid in captivity, and also is more highly coloured. In appearance it at once calls to mind eggs of the *Rallidae*, while the egg from Paris can hardly be said to show such an affinity. It is to be hoped that before long greater success may attend the attempts at inducing this interesting form to breed, either in the Jardin des Plantes or the Gardens of our Society, so that some more distinct conclusion may be drawn, from the evidence thus to be obtained, as to the affinities of *Cariama*."

The following papers were read:—

- I. Account of the Zoological Collections made during the Survey of H.M.S. 'Alert' in the Straits of Magellan and on the Coast of Patagonia. Communicated by Dr. ALBERT GÜNTHER, F.R.S., F.Z.S., Keeper of the Zoological Department, British Museum.

[Received November 4, 1880.]

(Plates I.-XI.)

- |   |   |
|---|---|
| I. Mammalia, by OLDFIELD THOMAS, p. 3.                            | VII. Coleoptera, by G. O. WATERHOUSE, p. 80.                          |
| II. Birds, by R. B. SHARPE, p. 6.                                 | VIII. Lepidoptera, Orthoptera, and Hemiptera, by A. G. BURNER, p. 82. |
| III. Reptiles, Batrachians, and Fishes, by Dr. A. GÜNTHER, p. 18. | IX. Echinodermata, by F. J. BRILL, p. 87.                             |
| IV. Mollusca and Molluscoida, by E. A. SMITH, p. 22.              | X. Coelenterata and Spongiidae, by S. O. RIDLEY, p. 101.              |
| V. Polyzoa, by S. O. RIDLEY, p. 41.                               |   |
| VI. Crustacea, by E. J. MIERIS, p. 61.                            |   |

The collections described in the following series of papers were made by Dr. R. W. COPPINGER, Staff-Surgeon of H.M.S. 'Alert,' during the cruise of that ship on the coasts of the southern ex-

tremity of the American continent, and transmitted to the British Museum by command of the Lords Commissioners of the Admiralty.

The collections arrived in two consignments—the first in September 1879, and the second in July 1880. With regard to the former, Dr. Coppinger writes:—"The specimens were obtained, with few exceptions, in the western portion of the Magellan region, and in the immediate neighbourhood of the Madre-de-Dios archipelago, off the west coast of Patagonia. They will be found duly labelled as to the localities in which they were obtained; and I may add that all of the specimens which are not otherwise noted were found in the living state." The second consignment consisted of specimens partly collected in the same district, partly more northwards, as far as Coquimbo. It contained also some dredgings and pelagic animals from the Atlantic, which do not come within the scope of this Report; and a series of fossils from Sandy Point and Quiriquina Island, which were delivered to the Department of Geology.

Dr. Coppinger was fully aware of the special interest attached to the marine fauna of these coasts. Essentially antarctic in its character, it comprises a number of forms closely allied to, nay, even identical with, arctic animals, such as he himself had observed and assisted to collect during the voyage to the Polar Seas, under the command of Capt. Sir G. Nares. He directed his attention especially to the marine Invertebrata; and consequently the majority of novelties will be found in those classes; yet also the series of marine Vertebrates, small as it is, contains forms of no small interest which had escaped the notice of his immediate predecessors the naturalists of H.M.S.S. 'Nassau' and 'Challenger.' The best thanks of zoologists are due to the Lords of the Admiralty, from whom Dr. Coppinger has received every encouragement in making this valuable contribution to our knowledge of the Antarctic fauna.

The various parts of the collection have been examined and described by the staff of the Zoological Department; and for the convenience of the student of this fauna it seems desirable to give the results of these examinations in a connected form and systematic order.

## I. MAMMALIA.

By OLDFIELD THOMAS.

The Mammalia collected by Dr. Coppinger are few in number; but they include specimens of a new and handsome species of *Hesperomys*, which I propose to name after the collector, and a series of skulls of some of the Magellan Seals. The species are as follows:—

### 1. *LUTRA FELINA*, Mol.

Two skulls, a skeleton, and two skins from Magellan Straits and the west coast of Patagonia.

## 2. OGMORHINUS LEPTONYX (Blainv.).

*Stenorhynchus leptonyx*, auct.

One skull from the Falkland Isles.

## 3. OTARIA JUBATA, Desm.

Four skulls from the Magellan Straits. One of these skulls, apparently rather aged, has only five teeth on each side above and below, as in the genus *Zalophus*; it has, however, the concave palate and other characters of this genus. There is no appearance of there ever having been a sixth pair of teeth; but its absence is no doubt only an individual variation.

4. ARCTOCEPHALUS AUSTRALIS, Zimm.<sup>1</sup>

The skin of a young specimen "six weeks old," and five skulls from the Magellan Straits.

## 5. HESPEROMYS (CALOMYS) COPPINGERI, sp. n.

A skin from Tom Bay, and two specimens in spirit "caught with trap on a wooded islet about one acre in extent" in Cockle Cove, (Feb. 9, 1879).

Fur very long and soft, fully half an inch in length on the back. Ears rather short, nearly hidden in the fur. Whiskers of medium length, the shorter lower ones forming a thick shining white fringe along the upper lip. On the head and back the wool-hair is of a deep slaty blue for nine tenths of its length; then follows a subterminal band of yellow; and the extreme tip is black. Mixed with

Fig. 1.

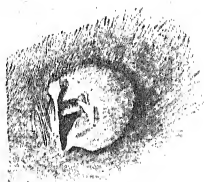
Left ear of *Hesperomys coppingeri*.

Fig. 2.

Right foot of *Hesperomys coppingeri*.

this wool-hair there are a considerable number of longer black hairs, the resulting general colour being very similar to that of the common Water-vole (*Arvicola amphibius*, L.). The dark colour of the upperside extends on the limbs to the wrists and ankles, the feet being covered with short shining white hairs. The ears are thickly clothed with short woolly hairs similar in colour to the fur of the back. On the sides the yellow tips of the hairs gradually become lighter, and on the belly they are nearly pure white, the basal portion of the fur, however, from the chin to the anus, still being slate-coloured.

<sup>1</sup> Cf. J. A. Allen, N. Amer. Pinnipeds, p. 210, 1880.



The tail is very long and but scantily haired; on the upperside the scales are grey and the hairs dark reddish brown, on the lower the scales are pale yellow and the hairs white; along the centre of the underside, however, there is a distinct narrow line of dark-brown hairs, contrasting with the white ones on either side.

The ears possess, at about one third the height of the inner margin, a small projecting lobule, which seems to be present in many species of this genus, and to be well worthy of notice, as being very constant in the species in which it is found. The foot-pads are small but distinct, and the surface of the palms and the distal half of the soles are coarsely granulated, as shown in the woodcut.

The skull is that of a typical *Hesperomys*, but shows only a very faint trace of the supraorbital ridges supposed to be characteristic of the subgenus *Calomys*, to which, however, the species undoubtedly belongs, as proved by its long tail and murine form.

The following are the dimensions of the two spirit specimens, both of which are adult males :—

	<i>a.</i>	<i>b.</i>
	inches.	inches.
Length of head and body .....	4·3	4·2
„ tail .....	6·4	6·1
„ head .....	1·4	
„ ear .....	0·55	0·53
„ hind foot without claws ....	1·3	1·22
Distance from muzzle to ear-orifice....	1·08	

Measurements of skull of *b* :—

	inch.
Length .....	1·2
Breadth .....	0·65
Breadth between orbits .....	0·16
Length of nasals .....	0·4
„ lower jaw, from condyle to tip of incisors ..	0·76

The species to which *H. coppingeri* appears most nearly allied are *H. lutescens*, Gay<sup>1</sup>, and *H. philippii*, Landb.<sup>2</sup>, both from Chili. The first, however, is much larger, being 5·7 inches in length, while its tail is only as long as the trunk. Moreover the skull, as figured by Gay, possesses strong supraorbital ridges, while our three specimens of *H. coppingeri*, as stated above, show but little trace of them. *H. philippii*, though somewhat similar in size and colour, may be readily distinguished by the extreme shortness of its tarsus (0·8 in.); and by the character of its fur, which is described as being short and fine, while that of *H. coppingeri*, as mentioned above, is particularly long and soft.

6. *HESPEROMYS* (*HABROTHRIX*) *XANTHORHINUS*, Waterh.

A skin from Monteith Bay, and a specimen in spirit from Sandy Point.

<sup>1</sup> Hist. Chile, i. p. 118; Atlas, pl. vii. fig. 2.

<sup>2</sup> Wiegman. Archiv, 1858, i. p. 80.

7. *CTENOMYS MAGELLANICUS*, Benn.

A spirit specimen from Pechett Harbour.

8. *OCTODON DEGUS*, Mol.

Two skins from Coquimbo (June 1879).

9. *MYOPOTAMUS COYPU*, Mol.

A skin from Swallow Bay (March 21, 1880), and a skin and skeleton from Talcahuano, Concepcion (September 1879).

10. *PHYSALUS*, sp.

A cervical vertebra and two tympanic bones of a species of this genus, obtained at Point Rosario, are in the collection, but are not sufficient to enable me to identify the species.

Besides these specimens, Dr. Coppinger discovered, in caves on the cliffs, various human and mammalian remains, of which, we may hope, he himself will give an account, with full details of the circumstances under which they were found.

## II. BIRDS.

By R. BOWDLER SHARPE.

Although the region in which Dr. Coppinger has been working has already received considerable attention from ornithologists, so that no novelties are to be expected, yet the careful way in which Dr. Coppinger has prepared and labelled his specimens, and the localities and dates he gives, render his collections very interesting. The following extracts are taken from one of his letters, in which he alludes to the localities where his first collection was obtained. Writing from Coquimbo in June 1879, Dr. Coppinger observes:—"The collection of birds will appear, at first sight, very incomplete, at least when compared with those which have been made by ships previously employed in surveying in the Magellan region. I wish, therefore, to call attention to the circumstance that the surveying operations of the 'Alert' have hitherto been confined to the archipelago fringing the west coast of Patagonia, and chiefly to the neighbourhood of the Trinidad Channel in 50° S. latitude, where the rainfall is excessive, and the Bird-fauna scanty as compared with that part of the Magellan region situated to the eastward of Port Famine and Sandy Point."

A few eggs were also sent by Dr. Coppinger; but they call for very few remarks, having already in most cases been described by Professor Newton (*Ibis*, 1870, p. 501).

In the present paper I have referred to the three essays published in the '*Ibis*' by Messrs. Selater and Salvin, as follows:—

1. "List of Birds collected in the Straits of Magellan by Dr. Cunningham, with remarks on the Patagonian Avifauna," *Ibis*, 1868, pp. 183-189.

2. "Second list of Birds collected by Dr. Cunningham," Ibis, 1869, pp. 283-286.

3. "Third list of Birds collected by Dr. Cunningham," Ibis, 1870, pp. 499-504.

I have also referred to the paper by the same gentlemen on the birds collected in Antarctic America during the voyage of H.M.S. 'Challenger,' P. Z. S. 1878, pp. 431-438.

Where the species do not occur in any of the above lists, I have referred to the 'Nomenclator Avium Neotropicalium' of the same authors; and the classification followed is that of the latter work.

1. *TURDUS MAGELLANICUS*, King; Seebohm, Cat. B. v. p. 224.

*Turdus falklandicus*, Q. & G. apud Sci. & Salv. Ibis, 1868, p. 186; iid. P. Z. S. 1878, p. 431.

No. 31. ♂ ad.: Cockle Cove, Straits of Magellan. Bill yellow; iris yellow.

No. 21. ♂ juv.: Tom Bay, Straits of Magellan, February 24, 1879. Legs yellow; bill yellow; claws black.

No. 117. ♀ ad.: Cockle Cove, October 17, 1879. Bill yellow; eyes dark; legs and feet yellow.

2. *MIMUS THENCA* (Mol.); Sci. & Salv. Ibis, 1870, p. 499.

No. 95. ♀: Coquimbo, July 1879. Gizzard containing seeds, leaves, grass, and bones.

3. *PHRYGILUS GAYI* (Eyd. & Gerv.); Sci. & Salv. Ibis, 1868, p. 186, 1869, p. 285; iid. P. Z. S. 1878, p. 432.

No. 53. ♂: Tom Bay, January 18, 1879.

4. *PHRYGILUS FRUTICETI* (Kittl.); Sci. & Salv. Ibis, 1868, p. 185.

No. 108. ♂: Coquimbo, August 25, 1879. Eyes dark brown; bill yellow; legs yellow.

No. 111. Coquimbo, June 1879. Stomach very muscular, apparently containing seeds.

5. *ZONOTRICHIA CANICAPILLA*, Gould; Sci. & Salv. Ibis, 1868, p. 185; iid. Ibis, 1869, p. 284; iid. P. Z. S. 1878, p. 432.

No. 110. Puerto Bueno, November 1879. Iris brown; bill black; legs light grey.

6. *DIUCA GRISEA*, Less.; Sci. & Salv. Ibis, 1870, p. 499.

No. 109. ♀: Coquimbo, June 1879.

7. *STURNELLA MILITARIS* (L.); Sci. & Salv. Ibis, 1863, p. 186.

No. 29. ♂: Peckett Harbour, Straits of Magellan, January 4, 1879.

8. *CURÆUS ATERRIMUS* (Kittl.); Sci. & Salv. Ibis, 1869, p. 283; iid. P. Z. S. 1878, p. 432.

No. 18. ♂: Tom Bay, March 6, 1879. Eyes dark, eyelids black; feet and legs black; bill black.

No. 85. ♂: Isthmus Bay, Straits of Magellan, January 11, 1879.

An egg, much broken, is also forwarded. It is pure white, and measures, axis 1·1 inch, diam. 0·8.

9. *CENTRITES NIGER* (Bodd.); *Scl. & Salv. Ibis*, 1868, p. 187; *iid. P. Z. S.* 1878, p. 432.

No. 33. Cape Gregory, January 1, 1879.

10. *ANÆRETES PARVULUS* (Kittl.); *Scl. & Salv. Ibis*, 1869, p. 283; *iid. P. Z. S.* 1878, p. 432.

No. 36. ♂: Malaspina Islands, Trinidad Channel, February 16, 1879. Bill and legs black.

11. *PTEROPTOCHUS ALBICOLLIS*, Kittl.; *Scl. & Salv. Nomencl. Av. Neotr.* p. 76.

No. 96. ♂: Coquimbo, August 5, 1879. Eyes dark brown; legs and bill black.

12. *GEOSITTA CUNICULARIA* (V.); *Scl. & Salv. Ibis*, 1870, p. 499.

No. 106. ♂: Coquimbo, June 1879.

13. *TENIOPTERA PYROPE*, Kittl.; *Scl. & Salv. Ibis*, 1868, p. 187.

No. 97. ♀: Skyring Water, March 1880. Iris light yellow; bill black; legs and feet black.

14. *AGRIORNIS MARITIMA*, Lafr. et d'Orb.; *Scl. & Salv. Ibis*, 1868, p. 185.

No. 94. ♀: Coquimbo, June 1879. Stomach containing remains of insects (locusts).

15. *MUSCISAXICOLA MENTALIS* (Lafr. et d'Orb.); *Scl. & Salv. Ibis*, 1868, p. 187.

No. 112. Coquimbo, June 1879.

16. *CINCLODES FUSCUS* (V.); *Scl. & Salv. Ibis*, 1868, p. 186.

No. 47. ♂: Peckett Harbour, January 4, 1879.

No. 104. ♂: Coquimbo, June 1879. From sea-shore rocks.

17. *CINCLODES PATACHONICUS* (Gm.); *Scl. & Salv. Ibis*, 1868, p. 186, 1869, p. 283; *iid. P. Z. S.* 1878, p. 433.

No. 49. ♂: Tom Bay, January 23, 1879.

No. 50. Elizabeth Island, January 6, 1879.

No. 20. Twenthu Island, Trinidad Channel, February 25, 1879.

18. *UPUCERTHIA DUMETORIA*, Geoffr. et d'Orb.; Scl. & Salv. Ibis, 1868, p. 187.

No. 105. ♀: Coquimbo, June 1879. Legs greyish pink.

19. *OXYURUS SPINICAUDA* (Gm.); Scl. & Salv. Ibis, 1868, p. 185; iid. P.Z.S. 1868, p. 433.

No. 115. ♂: Port Riofrio, west coast of Patagonia.

No. 38. Trinidad Channel, February 1879.

20. *PYGARRHICUS ALBIGULARIS* (King); Scl. & Salv. P. Z. S. 1878, p. 433.

No. 114. Skyring Water, Magellan's Straits, March 1880. Iris black; bill and legs horn-colour.

21. *EUSTEPHANUS GALERITUS* (Mol.); Scl. & Salv. Ibis, 1869, p. 283; iid. P. Z. S. 1878, p. 433.

No. 35. ♀: Cockle Cove, February 9, 1879.

22. *PATAGONA GIGAS* (Mol.); Scl. & Salv. Ibis, 1870, p. 499.

No. 113. Coquimbo, August 25, 1879. Eyes black; bill and legs black.

23. *CERYLE STELLATA* (Meyen); Scl. & Salv. Ibis, 1868, p. 187, 1869, p. 283; iid. P. Z. S. 1878, p. 434.

No. 25. ♂: Cockle Cove, February 7, 1879.

A. Sternum. (Tom Bay.)

24. *STENOPSIS BIFASCIATA* (Gould); Scl. & Salv. Nomencl. Av. Neotr. p. 96.

No. 107. ♀: Coquimbo, June 1879. Eyes yellow.

25. *ZENAIDA MACULATA* (V.); Scl. & Salv. Nomencl. Av. Neotr. p. 132.

No. 118. ♂: Coquimbo, June 1879. Bill dark; legs red.

26. *RHINOGRYPHUS AURA* (L.); Sharpe, Linn. Soc. Journ. xiii. p. 21.

*Cathartes aura* (L.); Scl. & Salv. Ibis, 1869, p. 284; iid. P.Z.S. 1878, p. 435.

a. ♂: Tom Bay, April 11, 1879. Iris dark; eyelids and cere flesh-colour; bill horn-colour; legs dirty yellow.

b. ♀: Tom Bay, April 11, 1879. Eyes dark; skin of head and neck light red; legs and feet dirty grey.

A. Trachea.

The two specimens sent by Dr. Coppinger would appear, from a comparison of the skins, to be of the same species as the ordinary *Rhinogryphus aura* of North America. I have already determined Chilean specimens in the British Museum as belonging to the last-named species; and, as far as I can now judge from the increased series in that collection, the grey-winged Vulturés are confined to

the Falkland Islands. I presume that Dr. Coppinger's specimens are a pair, male and female being shot on the same day—the difference in the colour of the soft parts being a very noticeable feature; while I must at the same time admit that the female with her "light red" head has more grey edgings to the wing-feathers than the male, and thus shows an approach to *R. falklandicus*.

27. *IBYCTER CHIMANGO* (V.); Sharpe, Cat. B. i. p. 41.

*Milvago chimango* (V.); Sel. & Salv. Ibis, 1868, p. 187; iid. P. Z. S. 1878, p. 435.

No. 6. ♂: Cockle Cove, February 9, 1879. Legs olive-green, claws black; irides dark grey; cere grey.

No. 82. ♂: Talcahuano, September 1879. Eyes light brown; legs grey; bill grey and white.

28. *POLYBORUS THARUS* (Mol.); Sharpe, Cat. B. i. p. 31; Sel. & Salv. Ibis, 1868, p. 188, 1870, p. 499; iid. P. Z. S. 1878, p. 435.

No. 57. ♂ juv.: Port Henry, Straits of Magellan, January 25, 1879. Cere fleshy grey; eyes black.

No. 14. ♀ juv.: Port Henry, January 25, 1879. Cere orange; tarsi grey and yellow.

No. 12. ♀ ad.: Tom Bay, March 1879. Bill grey; cere orange-yellow; tarsi grey; feet yellow; claws black.

29. *CIRCUS CINEREUS*, V.; Sharpe, Cat. B. i. p. 56.

No. 83. ♀: Coquimbo, June 1879. Legs and feet yellow; claws black. Stomach containing remains of birds.

30. *CERCHNEIS CINNAMOMINA* (Sw.); Sharpe, Cat. B. i. p. 439.

*Tinnunculus sparverius* (L.); Sel. & Salv. Ibis, 1868, p. 188, 1870, p. 499; iid. P. Z. S. 1878, p. 434.

No. 119. ♀: Coquimbo, June 1879. Legs grey; feet yellow; bill blue. Stomach containing remains of birds.

31. *BUBO MAGELLANICUS* (Gm.); Sharpe, Cat. B. ii. p. 29; Sel. & Salv. Ibis, 1868, p. 188.

No. 45. ♂: Cape Gregory, Straits of Magellan, January 1879. Irides golden yellow; horns prominent; claws black.

No. 44. ♀: Port Henry, Straits of Magellan, January 28, 1879.

No. 138. ♂: Mayne Harbour, Straits of Magellan, January 1879.

The female is a much darker bird than the male, suggesting almost the possibility of its being in melanistic plumage; the general aspect of the upper surface is almost uniform; and the centre tail-feathers have no cross bars at all. In the male the light cross bands are seven in number, without counting the whitish apical band.

32. *SPEOTYTO CUNICULARIA* (Mol.); Sharpe, Cat. B. ii. p. 142.

*Pholeoptynx cunicularia* (Mol.); Sel. & Salv. Ibis, 1868, p. 188.

No. 120. ♀: Coquimbo, June 1879. Eyes yellow; feet grey in front, yellow behind; bill horn-colour.

33. *GLAUCIDIUM NANUM* (King); Sharpe, Cat. B. ii. p. 190; *Scl. & Salv. Ibis*, 1868, p. 188.

No. 30. Sandy Point, January 1879.

34. *PHALACROCORAX MAGELLANICUS* (Gm.); *Scl. & Salv. Ibis*, 1870, p. 499.

No. 7. ♀: Trinidad Channel, February 27, 1879. Iris reddish brown; lids and wattled skin of a blood-red colour; legs grey in front, dusky black behind.

35. *PHALACROCORAX IMPERIALIS* (King); *Scl. & Salv. P. Z. S.* 1878, p. 652.

*P. carunculatus* (Gm.), *iid. Ibis*, 1869, p. 284, 1870, p. 499.

No. 40. ♀: Tom Bay, April 4, 1879. Iris brown; cere dark grey; eyelids dark grey; legs and feet light grey anteriorly, and dark grey posteriorly.

36. *CESTRELATA DEFILIPPIANA*, Salvad. & Gigl.; *Salv. in Rowley's Orn. Misc. i. p. 255, pl. xxxiii.*

No. 64. ♂: St. Ambrose, July 21, 1879. Bill black; tarsi lavender-coloured.

37. *THALASSOCA TENUIROSTRIS*, Audub.; Sharpe, *Rep. Trans. Venus Exp.*, B. Kerguel. p. 23.

*Fulmarus glacialoides* (Smith); *Scl. & Salv. Ibis*, 1868, p. 189.

*Thalassoca glacialoides* (Smith); *Salv. P. Z. S.* 1878, p. 736.

No. 63. ♂: Valparaiso, August 4, 1879. Legs grey, with blue stains; bill grey, with blue patches.

A. Sternum.

38. *OCEANITES GRALLARIA* (V.).

*Fregata grallaria* (V.); *Salv. P. Z. S.* 1868, p. 735.

*Thalassidroma gracilis*, Elliot, *Ibis*, 1859, p. 391.

*T. segethi*, Ph. & Landb. *Arch. f. Naturg.* 1850, p. 282.

No. 65. ♀: off St. Ambrose, July 20, 1879. Bill and feet black.

Mr. Salvin has already suggested the identity of the Chilean birds described by Mr. Elliot and Drs. Philippi and Landbeck with *O. leucogastra* of Gould (*T. grallaria*, V.); and from the specimen now sent by Dr. Coppinger, I must say that I can see no difference at all.

39. *OCEANITES OCEANICA* (Kuhl); Sharpe, *Report Trans. Venus Exped. Birds*, p. 32; *Salvin, P. Z. S.* 1878, p. 735.

No. 37. ♂: lat. 9° 47' S., long. 33° 5' W., November 8, 1878. Caught at sea.

40. *OSSIFRAGA GIGANTEA* (Gm.); Sharpe, *Report Trans. Venus Exped., Birds*, p. 142; *Salvin, P. Z. S.* 1878, p. 737.

No. 4. ♂: Tom Bay, April 13, 1879. Bill light grey; iris dark brown; eyelids black; legs and feet dark grey.

No. 61. ♂: Valparaiso, August 4, 1879. Legs black.

No. 126 ♂?: Valparaiso, August 18, 1879.

A. Sternum.

41. DIOMEDEA MELANOPHRYS, Temm.; Salv. P. Z. S. 1878, p. 740.

No. 86. ♂: Valparaiso, August 13, 1879. Bill grey, with dark tips; feet light grey; iris dark brown.

A. Trachea.

42. PELECANOIDES URINATRIX (Gm.); Sharpe, Report Trans. of Venus Exped., Birds, p. 14.

*P. garnoti* (Less.); Salvin, P. Z. S. 1878, p. 739.

No. 34. ♀: Antonio Islands, Trinidad Channel, February 17, 1879. Eyes black; bill black; legs slate-colour. Stomach containing small Crustacea.

No. 96. ♀: Cockle Cove, October 16, 1879. Bill black; iris dark brown; legs and feet slate-coloured.

The following are the dimensions of the adult specimen:—total length 8·5 inches, culmen 0·75, wing 4·9, tail 1·7, tarsus 1. These measurements exceed those of the specimens already in the Museum from the Straits of Magellan, and appear to be intermediate between the ordinary *P. urinatrix* and the larger *P. garnoti*, which, after all, does not seem to be a very distinct species.

43. DAPTION CAPENSIS (L.); Sharpe, Report Trans. of Venus Exped., Birds, p. 19; Salvin, P. Z. S. 1878, p. 737.

No. 2. ♂: off Tres Montes, May 10, 1879. Iris dark brown; bill and legs black; eyelids black.

♂: off St. Ambrose, July 20, 1879. Iris dark grey.

No. 135. ♂: lat. 31° 52' S., long. 18° 37' W. Iris dark grey.

A. Sternum.

44. MAJAEQUEUS AEQUINOCTIALIS (L.); Salvin, P. Z. S. 1878, p. 737.

No. 132. ♂: Valparaiso, August 1879. Eyes dark brown; bill grey and black; legs black.

No. 62. ♀: Valparaiso, August 13, 1879. Same soft parts as ♂.

No. 139. ♂: Valparaiso, August 18, 1879.

45. ATTAGIS FALKLANDICA (Gm.); Sel. & Salv. Ibis, 1868, p. 188.

No. 24. ♂: Cockle Cove, February 14, 1879. Shot on summit of mountain.

46. NYCTICORAX OBSCURUS (Licht.); Sel. & Salv. Ibis 1868, p. 189, 1869, p. 285; iid. P. Z. S. 1878, p. 436.

No. 54. ♀ ad.: Cockle Cove, February 11, 1879. Iris orange; legs dark grey; bill horn-colour.



No. 5. Young: Neesham Cove, Trinidad Channel, February 28, 1879. Iris orange; bill black above, greenish yellow beneath; eyelids greenish yellow; legs dark grey in front, yellow behind.

No. 55. ♂ juv.: Cockle Cove, February 12, 1879. Bill black; cere green; iris and legs as in No. 5.

47. *BERNICLE ANTARCTICA* (Gm.); *Scl. & Salv. P.Z.S.* 1878, p. 437.

*Chloephaga antarctica*, iid. *Ibis*, 1869, p. 284, 1870, p. 499.

No. 59. ♂: Port Henry.

No. 43. ♀: Port Henry, February 1879.

No. 79. Pull.: Straits of Magellan, November 1879. Eyes dark grey; bill black; legs and feet dark brown.

48. *CHLOEPHAGA POLIOCEPHALA*, Sclater; *Scl. & Salv. Ibis*, 1868, p. 189, 1870, p. 489; iid. *P.Z.S.* 1878, p. 436.

No. 11. ♀: Neesham Cove, Trinidad Channel, February 28, 1879. Iris dark brown; bill horn-colour; legs black in front, orange at back.

No. 123. ♂: Alert Bay, December 3, 1879. Bill black; eyes dark brown; legs orange, black down the front.

No. 90. ♀ pull.: Port Henry, December 3, 1879. Eyes brown; legs dark grey; bill horn-colour.

49. *TACHYERES CINEREUS* (Gm.); *Scl. & Salv. P.Z.S.* 1878, p. 437.

*Micropterus cinereus* (Gm.); *Scl. & Salv. Ibis*, 1868, p. 189, 1870, p. 499.

No. 52. ♀: Puerto Bueno. Legs and feet yellow; bill greenish olive; eyes black. Shot on freshwater lake near the sea.

No. 60. Walney Sound, February 4, 1879. Weight  $10\frac{1}{2}$  lb. Crop full of entire mussels and prawns. Stink intense.

No. 58. Elizabeth Island, January 3, 1879.

No. 89. ♂ pull.: Tom Bay, November 30, 1879.

A. Skull. Cockle Cove.

B. Skeleton. Tom Bay, February 24, 1879.

50. *ANAS CRISTATA*, Gm.; *Scl. & Salv. Ibis*, 1870, p. 499.

No. 15. ♀: Port Rosario, March 15, 1879.

No. 3. ♀: Cockle Cove, February 7, 1879. Iris blood-red; legs dark grey; upper mandible horn-colour, lower one flesh-colour.

No. 130. ♂: Tom Bay, November 29, 1879. Eyes yellowish red; bill black.

The egg is creamy buff, and measures—axis 2.4 inches, diam. 1.65.

51. *MARECA SIBILATRIX* (Poeppig); *Scl. & Salv. P.Z.S.* 1876, p. 395.

*Mareca chilensis*, Eyton; *Scl. & Salv. Ibis*, 1869, p. 284.

No. 76. ♀: Coquimbo, June 1879.

52. *CYGNUS NIGRICOLLIS* (Gm.) ; Sel. & Salv. Ibis, 1869, p. 284.

No. 129. ♂: Hugh Bay, west coast of Patagonia, December 20, 1879. Bill blue with red crest; iris brown; legs and feet light grey.

*A.* Sternum. Oct. 1879.

53. *DAFILA SPINICAUDA* (V.) ; Sel. & Salv. Nomencl. Av. p. 130.

*a.* No. 78. ♂: Talcahuano, September 1879. Bill yellow, with black culmen; eyes brown; legs and feet grey and black.

54. *QUERQUEDULA CYANOPTERA* (V.) ; Sel. & Salv. Ibis, 1868, p. 189.

*a.* No. 138. ♂: Talcahuano, September 10, 1879. Iris yellow; bill black; legs and feet yellow; nails dark.

*b.* No. 71. ♂: Talcahuano, September 1879. Eyes yellow; bill black; legs yellow.

*c.* No. 72. ♀: Talcahuano, September 22, 1879. Eyes brown; bill dark, with grey patches; legs light brown.

55. *QUERQUEDULA OXYPTERA* (Meyen) ; Sel. & Salv. Nomencl. Av. Neotr. p. 129.

*a.* No. 75. ♂: Port Gallant, west coast of Patagonia, February 1880. Iris dark brown; bill yellow on sides, black culmen; legs and feet light grey.

*b.* No. 74. ♀: Cockle Cove, October 1879. Bill yellow, with black culmen; eyes yellow; legs and feet grey.

56. *RALLUS ANTARCTICUS*, King; Sel. & Salv. P.Z.S. 1878, p. 437.

No. 8. ♀: Tom Bay, April 13, 1879. Eyes dark red; legs red; bill with greenish lustre.

No. 123. ♂: Mayne Harbour, March 1880. Iris red; bill dark green; legs and feet red.

57. *FULICA LEUCOPYGIA*, Hartl.; Sel. & Salv. Nomencl. Av. Neotr. p. 140.

No. 80. ♂: Talcahuano, September 18, 1879. Bill yellow, with dark red patch on culmen; eyes yellow; legs olive-green; claws horn-colour.

58. *VANELLUS OCCIDENTALIS*, Harting; Sel. & Salv. P.Z.S. 1878, p. 437.

*Vanellus cayenensis*, Sel. & Salv. Ibis, 1869, p. 284 (nec Gm.).

No. 56. Peckett Harbour, January 4, 1879.

No. 79. ♂: Talcahuano, Chili, September 22, 1879. Iris, pupil dark red; bill lilac, with black tips; eyelids lilac; legs rose-colour, with grey feet.

59. *EUDROMIAS MODESTA* (Licht.); *Scl. & Salv. Ibis*, 1868, p. 188, 1870, p. 500; *iid. P. Z. S.* 1878, p. 488.

No. 19. Ad.: Tom Bay, February 1879.

No. 28. ♂ juv.: Puerto del Morro, February 5, 1879.

No. 102. ♂ juv.: Port Henry, January 28, 1879. Eyes black; legs grey; bill horn-colour.

No. 98. ♂: Cockle Cove, October 16, 1879. Iris dark brown; bill dark; legs light grey.

60. *ÆGIALITIS NIVOSA* (Cass.); *Scl. & Salv. Nomencl. Av. Neotr.* p. 143.

No. 103. ♂: Coquimbo, June 1879.

61. *STREPSILAS INTERPRES* (L.); *Scl. & Salv. Nomencl. Av. Neotr.* p. 143.

No. 116. ♂: Talcahuano, September 9, 1879. Iris brown; bill horn-colour; legs and feet red.

62. *APHRIZA VIRGATA* (Lath.); *Scl. & Salv. Nomencl. Av. Neotr.* p. 143.

No. 25. ♂: Van Islands, Trinidad Channel, February 15, 1879. Iris black; eyelids black; legs olive-green; claws black. In flocks, as if about to migrate.

63. *HÆMATOPUS LEUCOPUS* (Garnot); *Scl. & Salv. P. Z. S.* 1878, p. 437.

No. 23. ♀: Cape Sambo, Trinidad Channel, March 3, 1879. Iris bright yellow; eyelids yellow; feet and legs flesh-coloured; claws black.

No. 133. ♂: Tom Bay, January 16, 1879. Iris and eyelid brilliant yellow; tarsi grey; bill orange.

No. . ♂: Tom Bay, January 16, 1879. Bill orange-red.

No. 92. ♂ juv.: Hugh Bay, December 27, 1879. Iris orange; legs and feet grey; bill orange, the base black.

*A. Skeleton.* West coast of Patagonia.

64. *HÆMATOPUS ATER* (V.); *Scl. & Salv. Ibis*, 1870, p. 499; *iid. P. Z. S.* 1878, p. 438.

No. 22. ♀: Port Henry, January 29, 1879. Eyes black; eyelids orange-red; bill orange-red; feet grey.

65. *GALLINAGO PARAGUAIÆ* (V.); *Scl. & Salv. P. Z. S.* 1868, p. 189; *iid. P. Z. S.* 1878, p. 438.

No. 27. ♀: Cockle Cove, February 7, 1879.

66. *GALLINAGO STRICKLANDI*, Gray; *Scl. & Salv. Nomencl. Av. Neotr.* p. 145.

No. 121. ♀: Swallow Bay, March 14, 1880. Eyes dark; legs and feet greyish yellow. Weight 9 oz.

67. *RHYNCHEA SEMICOLLARIS* (V.); *Scl. & Salv. Nomencl. Av. Neotr.* p. 145.

No. 101. ♀: Coquimbo, June 1879. Tarsi green; tips of bill yellow.

68. *TRINGA FUSCICOLLIS* (V.); *Scl. & Salv. P. Z. S.* 1878, p. 438.

No. 46. ♀ in winter plumage: Peckett Harbour, January 4, 1879.

69. *CALIDRIS ARENARIA* (L.); *Scl. & Salv. Nomencl. Av. Neotr.* p. 143.

No. 99. ♀: Talcahuano, September 1879. Bill, legs, and feet black; eyes brown.

70. *GAMBETTA MELANOLEUCA* (Gm.); *Scl. & Salv. Nomencl.* p. 145.

Nos. 125, 77. ♂: Talcahuano, April 1880. Iris dark; bill horn-colour; legs and feet yellow.

71. *NUMENIUS HUDSONICUS* (L.); *Scl. & Salv. Nomencl. Av. Neotr.* p. 146.

No. 78. ♀: Talcahuano, September 1879. Legs and feet grey; bill horn-colour; eyes dark brown.

72. *STERNA HIRUNDINACEA*, Less.; *Saunders, P. Z. S.* 1876, p. 647.

*Sterna cassini*, *Scl. & Salv. Ibis*, 1870, p. 500.

a. No. 81. ♂: Tom Bay, November 30, 1879. Bill, legs, and feet red.

b. No. 93. ♂ pull.: Tom Bay, November 29, 1879.

c. ♀: Cockle Cove, October 16, 1879. Bill and legs red; claws black; iris dark.

73. *ANOUS CINEREUS*, Gould; *Sharpe, P. Z. S.* 1878, p. 272.

No. 66. ♀: off St. Ambrose, July 21, 1879. Bill black; legs nearly black; eyes dark.

74. *LARUS GLAUCODES*, Meyen; *Scl. & Salv. P. Z. S.* 1871, p. 578; *Saunders, P. Z. S.* 1878, p. 203.

No. 51. ♂: Cape Gregory, January 1, 1879.

75. *LARUS CIRRHOCEPHALUS*, Vieill.; *Scl. & Salv. P. Z. S.* 1871, p. 578; *Saunders, P. Z. S.* 1878, p. 204.

No. 69. ♂ hiem.: Talcahuano, September 10, 1879. Bill dark red; legs and feet orange-red; iris brown.

No. 68. ♂ æstiv.: Talcahuano, September 1879. Soft parts as in No. 69; legs and feet red.

No. 87. ♂: Talcahuano, September 8, 1879. Iris hazel; eyelids orange-red; bill dark red; legs and feet red.

♀. Skeleton. Talcahuano, September 1879.

The last bird still retains traces of white plumage amongst the feathers of the head, while No. 69 is a winter-plumaged bird with white head, on which a few dark feathers are just showing themselves.

76. *LARUS DOMINICANUS* (Licht.), *Scl. & Salv. Ibis*, 1868, p. 189, 1869, p. 284; *Saunders, P. Z. S.* 1877, p. 799.

No. 39. ♂ ad.: Tom Bay, April 5, 1879. Iris clear grey; eyelids red; legs olive.

No. 17. ♂ juv.: Cockle Cove, February 14, 1879. Eyes black; bill black; legs dark grey.

No. 16. ♂ juv.: Tom Bay, March 8, 1879. Iris dark brown; eyelids black; bill black; legs grey.

No. 70. ♀ in changing plumage: Valparaiso, August 13, 1879. Bill grey with black tip; eyes dark; legs light grey; claws black.

No. . ♀ ad.: Peckett Harbour, Straits of Magellan, January 4, 1879. Bill yellow, the end of lower mandible red; eyelids red; eyes clear grey; legs greenish.

No. . ♂ juv.: Puerto Bueno, February 21, 1879. Iris dark brown, the lids black; feet grey.

No. 131. Puerto Bueno, February 20, 1879. Bill black; legs dark grey.

No. . ♂: Port Henry, January 28, 1879. Eyelids red; irides grey; bill yellow, tip of lower mandible red; legs and feet olive-green; claws black.

77. *STERCORARIUS CHILENSIS*, Bp.; *Saunders, P. Z. S.* 1877, p. 800.

*Lestris antarctica* (Less.); *Scl. & Salv. Ibis*, 1869, p. 284.

No. 67. ♂: Straits of Magelhaen, December 1879. Bill, legs, and feet black; eyes brown.

No. 134. ♀: Talcahuano, September 1879. Eyes dark brown; legs and feet black.

78. *SPHENISCUS MAGELLANICUS* (Forst.); *Scl. & Salv. Ibis*, 1869, p. 284; *ibid. P. Z. S.* 1878, p. 653.

No. 42. Tom Bay, April 7, 1879. Iris brown; eyelids' edges black, not flesh-colour; bill horn-colour; feet in front black mottled with white, behind black all over.

No. 1. ♂ juv.: Tom Bay, February 17, 1879. Iris brown; eyelids black; bill black; legs grey spotted with black; claws black.

No. 128. ♀: Tom Bay, April 5, 1879. Bill horn-colour; iris brown; legs in front grey spotted with black; behind black.

A. Trachea. B. Sternum.

79. *PODICEPS ROLLANDI* (Q. et G.); *Scl. & Salv. Ibis*, 1868, p. 189, 1869, p. 84.

No. 13. Summer plumage. Portland Bay, March 20, 1879. Iris red; bill black; feet and legs black.

No. 48. Young ♂: Peckett Harbour, January 1, 1879.

No. 137. Picton Channel, March 31, 1879. Iris red; eyelids black; legs dark grey.

No. 81. Swallow Bay, March 14, 1880. Bill horn-colour; legs and feet olive-green.

No. 121. Port Riofrio, west coast of Patagonia, March 1880. Iris red; bill horn-colour; legs and feet grey.

♂. Talcahuano, September 1879. Bill black; eyes red; legs and feet grey.

81. *NOTHOPROCTA PERDICARIA* (Kittl.); *Scl. & Salv. Nomencl. Av. Neotr.* p. 153.

No. 122. ♂: Coquimbo, June 1879. Crop full of seeds.

### III. REPTILES, BATRACHIANS, and FISHES.

By A. GÜNTHER.

(Plates I., II.)

A few REPTILES only were collected, viz. *Liodira gravenhorstii* at Talcahuano, and *Liolamys nigromaculatus* at Coquimbo, also a specimen of *Tachymenis chilensis* from the latter locality.

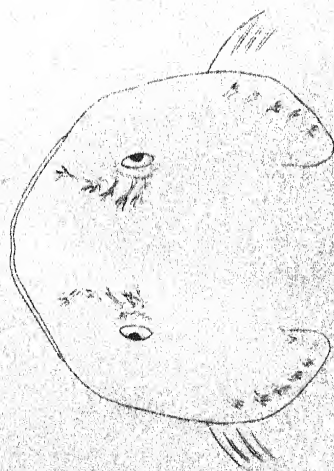
The BATRACHIANS proved to include more novelties:—

1. *NANNOPHYRNE VARIEGATA* (Gthr. *Proc. Zool. Soc.* 1870, p. 401, pl. 30) was collected in several examples on the coast of Trinidad Channel and at Puerto Bueno.

2. *CYSTIGNATHIUS MACRODACTYLUS*, sp. n.

Allied to *C. bibronii* from the Chonos archipelago, but with the vomerine teeth in two short straight transverse lines immediately behind the choanæ. Head broad and depressed, with shelving sides and obtusely rounded snout. Eyes of moderate size, equal to their distance from the nostril. Tympanum small, scarcely half the size of the eye. Skin of the upper parts smooth, or but little tubercular. The three outer fingers are long, and, like the toes, truncated at the tip; the third is the longest, the fourth longer than the second, which, again, is considerably longer than the first. Two small metatarsal tubercles; the fifth toe scarcely longer than the third. Upper and lateral parts mottled with brown; lower parts whitish, in the male with a few brown spots on the sides of the abdomen. Male with a large vocal sac, which extends to the sternal region.

	lines.
Length of the body . . . . .	15
Width of the cleft of the mouth . . . . .	5
Length of the fore limb . . . . .	11
"    "    third finger . . . . .	3½
"    "    second finger . . . . .	2½
"    "    hind limb . . . . .	25
"    "    entire foot, including tarsus . . .	12
"    "    fourth toe . . . . .	7½
"    "    third toe . . . . .	5



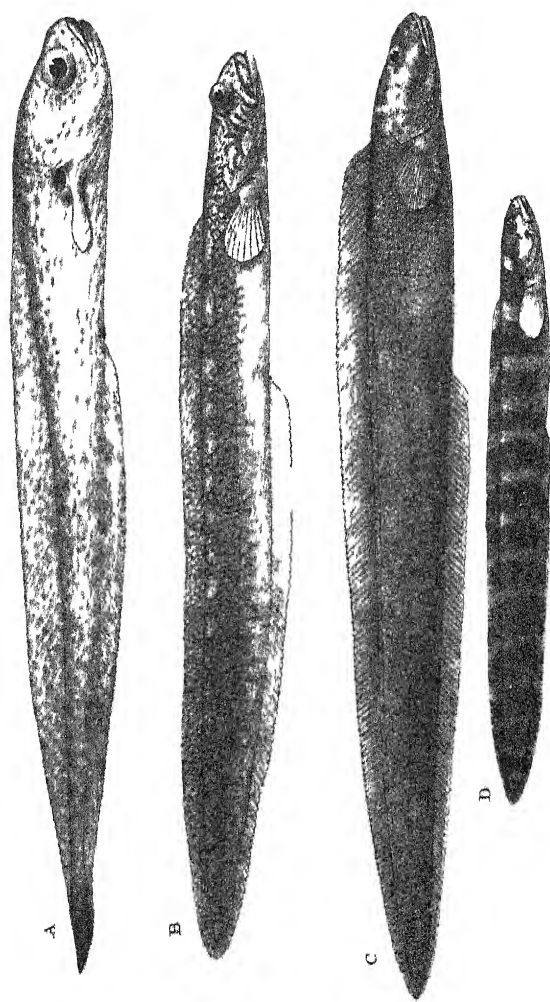
Monter Bros. Eng.

(Fishes of the Alert Survey.)  
*NEOPHYNICHTHYS LATUS.*

B. Minner. et al. Rio.







E. Mendenhall et al.

fin em Bros rrp

(Fishes of the "Alert" Survey)  
 A. MELANOSTIGMA GELATINOSUM B. GYNNELIS PICTUS C. D. MAYNEA PANTAGONICA



Three specimens, found in pools on the hills, 500 feet above the sea, at Puerto Bueno.

3. *CACOTUS COPPINGERI*, sp. n.

Snout broad, short (as long as the eye) and obtuse, with short canthus rostralis; loreal region sloping. Vomerine teeth in two transverse series, very slightly oblique, and commencing from the front margin of the choanæ, which are small. Tongue without any notch behind. Skin smooth. The length of the body equals the distance between the vent and metatarsal tubercles. Subarticular tubercles on the fingers and toes small; metatarsus with two small tubercles. The length of the fourth toe is contained twice and one third in that of the body; the third and fifth toes equal in length. Greenish olive; back, to the interorbital space, darker; a narrow dark band along the canthus rostralis and across the tympanic region; lower parts whitish.

A single specimen was obtained at Port Riofrio (west coast of Patagonia). Body  $1\frac{7}{8}$  inch long.

4. *CACOTUS CALCARATUS*, sp. n.

Snout rather short, somewhat longer than the eye, rather pointed, with distinct canthus rostralis and subvertical loreal region. Vomerine teeth indistinct, in two very small groups between the choanæ, which are very narrow. Tongue without any notch behind. Skin smooth; dorsal region with two linear ridges convergent behind; a short cutaneous spur at the heel is connected with the outer metatarsal tubercle by a low uneven fold of the skin. The length of the body is less than the distance between vent and metatarsal tubercles. Subarticular tubercles well developed; metatarsus with two small tubercles. The length of the fourth toe is two fifths of that of the body. Light brownish olive; a brown band from the eye towards the side of the body; a few small brown spots on the loin.

A single specimen, 11 lines long, was obtained in Chiloe by Dr. Cunningham. In the hope of obtaining another specimen before describing it, I have allowed this specimen to remain undescribed up to the present; but as there is but small prospect of the species being rediscovered for some time to come, I will not allow the present opportunity to pass of describing it with its congener from the mainland.

FISHES.

1. *SCYLLIUM CHILENSE*, Guich. Puerto del Morio and Portland Bay.

2. *PSAMMOBATUS RUDIS*, Gthr. Trinidad Channel, in 30 fathoms.

3. *CALLORHYNCHUS ANTARCTICUS*, Lac. Francisco Bay.

4. *SEBASTES OCLATUS*, C. V. Latitude Cove in 13 fathoms, and Tom Bay in 15 fathoms.

5. *AGRIOPUS PERUVIANUS*, C. V. West coast of Patagonia.
6. *ELEGINUS MACLOVINUS*, C. V. Tom Bay, from a brackish lagoon, and Cockle Cove.
7. *APIRITIS GOBIO*, Gthr. Portland Bay, Magellan's Straits, and Stanley Harbour, Falkland Islands.
8. *CHELENICHTHYS ESCH*, Gthr. Puerto Bueno.
9. *NOTOTHENIA MACROCEPHALA*, Gthr. Puerto Bueno and Trinidad Channel.
10. *NOTOTHENIA TESSELLATA*, Rich. Puerto del Morio, Latitude Cove, Puerto Bueno.
11. *NOTOTHENIA LONGIPES*, Steind. Isthmus Bay, in 14 fathoms.
12. *NOTOTHENIA CORNUCOLA*, Rich. Cockle Cove.
13. *TRACHURUS TRACHURUS*, L. Francisco Bay.
14. *NEOPHYRINICHTHYS LATUS*, Hutton. (Plate I.)

Of this very interesting fish, which was discovered only a few years ago by Mr. Hutton in New-Zealand, a specimen 16 inches long is in the collection. Fortunately, by the kindness of Mr. Hutton, I am in a position to compare the American specimen with one obtained on the New-Zealand coast. Structurally they are identical; only some small tentacles are developed in the American specimen above the eye and on some parts of the body. The coloration is a blackish brown, marbled with lighter brown and grey. These differences are not sufficient to indicate specific distinctness. The specimen was obtained in Swallow Bay (Magellan's Straits).

15. *LYCODES LATITANS*, Jen. Portland Bay.

16. *MAYNEA PATAGONICA*, Cunningham, Trans. Linn. Soc. xxvii. 1871, p. 472. (Plate II. figs. C and D.)

Of this fish a second, much younger specimen was discovered by Dr. Coppinger at Port Rosario. It is  $3\frac{1}{2}$  inches long, and marked by fourteen broad blackish-brown cross bands, of which there is no trace in the adult specimen. The fact that the same style of coloration obtains in the young stage of *Gymnelis pictus* (which also otherwise is so closely allied to *Maynea*) renders it all but certain that *G. pictus* is likewise an Antarctic species. We figure it here side by side with its nearest allies (Plate II. fig. B.).

#### MELANOSTIGMA, g. n. Lyeodid.

This genus agrees with *Gymnelis* and *Maynea* in the absence of ventral fins, and technically may be distinguished from both by the much more elongate teeth, which in the jaws, as well as on the vomer and palatines, stand in a single series. However, there are other

striking differences, which will be mentioned in the subsequent description. The fish is evidently habitually living at a greater depth than that at which Dr. Coppinger happened to obtain the single specimen in his collection.

17. *MELANOSTIGMA GELATINOSUM*. (Plate II. fig. A.)

The whole body is enveloped in a loose delicate skin, like *Liparis*. Head large, deep, compressed, with obtuse snout. Eye large, two sevenths of the length of the head, and longer than the snout. Cleft of the mouth rather oblique, but the lower jaw does not project beyond the upper. Lips not fleshy. Inside of the mouth, gill-openings, and vent black. The gill-opening is reduced to a very narrow foramen above the base of the pectoral fin. The origin of the dorsal fin and the root of the pectoral are enveloped in the loose skin of the body. The dorsal fin seems to commence above the middle of the pectoral, is low at first, but becomes considerably higher posteriorly. Pectoral very narrow, consisting of a few rays only. Upper parts tinged with a purplish grey; sides marbled with the same colour, which towards the end of the tail becomes more intense, almost black.

Total length of the specimen  $5\frac{1}{2}$  inches; distance of the snout from the gill-opening  $\frac{7}{8}$ , from the vent  $1\frac{7}{8}$ .

The specimen was obtained on January 15, 1880, at Tilly Bay, in the Straits of Magellan, in 24 fathoms.

18. *HIPPOGLOSSINA MACROPS*, Steindachn. Trinidad Channel.

19. *HIPPOGLOSSINA MICROPS*, sp. n.

D. 72. A. 56. V.  $1/5$ . The height of the body is contained twice and one third in the total length (without caudal), the length of the head thrice and one half. The eyes are, compared with those of *Hippoglossina macrops*, small, equal to the length of the snout, and two ninths of that of the head; the upper is slightly in advance of the lower; the space between them is flat, half as wide as the vertical diameter of the eye, and covered with minute scales. Mouth wide, the maxillary extending beyond the middle of the orbit. Anterior curve of the lateral line semicircular. Dorsal fin commencing above the eye, of moderate height; pectoral fin half the length of the head; ventrals well developed, symmetrically placed, greyish, finely mottled with brown.

A single specimen, 4 inches long, was obtained on the west coast of Patagonia.

20. *GALAXIAS ATTENUATUS*, Jen. Puerto Bueno.

21. *GALAXIAS COPPINGERI*, sp. n.

D. 12. A. 17. Body elongate, its depth in front of the dorsal being one tenth of the total length (without caudal), the length of the head two ninths. Snout rather broad, with the jaws equal in length; cleft of the mouth rather narrow, the maxillary extending to below the front margin of the orbit. Eye rather large, a little

shorter than the snout, and two sevenths of the length of the head. The length of the pectoral fin is one half of the distance of its root from the ventral, and that of the ventral one half of the distance of its root from the anal. Caudal fin truncate. Yellowish olive, trunk marbled with blackish.

One specimen, 3 inches long, from Alert Bay.

22. *HAPLOCHITON ZEBRA*, Jen. East Bay; freshwaters at Tom Bay.

23. *OPHICHTHYS DICELLURUS*, Rich. Coquimbo.

24. *MYXINE AUSTRALIS*, Jen.

#### IV. MOLLUSCA AND MOLLUSCOIDA.

By EDGAR A. SMITH.

(Plates III.-V.)

The collection of Mollusca contains several very interesting species, notably a new Cephalopod (*Rossia patagonica*), an undescribed *Lamellaria*, a very beautiful *Trochus*, and a new genus of Conchifera, besides several other species either new to science or to the fauna of Patagonia.

To avoid repetition of the localities in extenso a numbered list of the various Stations is here appended.

##### *List of Stations.*

1. Trinidad Channel, 30 fathoms; bottom sandy.
2. Port Rosario, 2-30 fathoms; bottom, sand and rock.
3. Tom Bay, 1-30 fathoms; bottom, rock, kelp, and mud.
4. Van Island, Trinidad Channel; on rocks in shallow water.
5. Portland Bay, St. Andrews Sound, 10 fathoms; bottom, hard sand.
6. Elizabeth Island, 6 fathoms; bottom, sand.
7. Sandy Point, 9-10 fathoms; bottom, sand.
8. Peckett's Harbour.

Nos. 1 to 5 are situated on the west of Southern Patagonia, in the neighbourhood of the island Madre de Dios, and nos. 6, 7 and 8 in the eastern part of the Straits of Magellan. Other localities mentioned are situated in South Patagonia.

#### I. CEPHALOPODA.

*ROSSIA PATAGONICA*, sp. n. (Plate III. figs. 3, 3a.)

Animal, viewed dorsally, of a purplish slate-colour. This is composed of a vast aggregation of minute irregularly shaped dots set upon a pale buff ground, which is more apparent upon the fins, as there the dotting is less dense. Lower or ventral surface of a reddish-purple color and the dotting more defined than above. The underside of the head light buff, with only a few large subcir-

cular spots, of the same hue as those on the body. The lower surface of the fins and the funnel are of a plain buff. The abdomen or body is in form like a short sack, narrowing and rounded at the end, about half as long again as broad. Its margin is produced to an obtuse point over the back of the neck, which marks the termination of the horny shell; and on the underside there is a wide sinuation beneath the siphon.

The fins are moderately large, being to the length of the body as 5 to 7; but the line of junction is somewhat less, for they extend forward about a line and a half beyond the point of contact. In form they are irregularly semicircular, and are placed rather far apart, but yet not absolutely along the side. Their surface, both above and beneath, exhibits fine striæ which radiate from the body.

The head is large, as broad as the body. The eyes are situated at the sides of the head, and are protected by a thin transparent membrane, and the lower margin is probably partly contractile over the eye.

The arms do not vary much in length; but the dorsal and ventral pairs are a trifle shorter than the two lateral pairs. They are rather slender, and taper to a fine point, scarcely have any interbrachial connecting membrane at their base; and between the ventral pair there is a total absence of it.

The suckers are large, subspherical, raised upon prominences, connected by excessively short peduncles, and armed with very small simple-edged horny rings. They are arranged in two alternating rows, except upon that which is the right arm of the dorsal pair when the lower or ventral surface is towards the eye, or the left one when viewed from above; upon this there are four series at the central part, but fewer at the base and the extremity; the suckers too are much smaller than those upon the rest of the brachia, with the exception of the other dorsal one, upon which they are also equally small.

The tentacular arms are slender, twice as long as the others, and emerge between the ventral and next pair of arms, between which there is a greater development of connecting membrane than is found between the other brachia. They are provided at the ends with numerous crowded cup-like acetabula, raised upon longer footstalks than those connecting the suckers of the other arms. They are flat-topped, with a raised outer rim and a sunken lid, and the horny margin of the orifice is minutely dentate. Shell or gladius very minute.

The measurements are:—Length of body 21 millims., diam. 14; length of fins 14 millims., diam. 8; length of longest arm 17 millims.; length of tentacular arm 36 millims.; length from the end of the body to the base of the ventral pair of arms 27 millims.; the same to the base of the dorsal pair 29 millims.; diam. of one of the largest spherical suckers  $1\frac{1}{2}$  millim.; diam. of one of the small ones on the right dorsal arm  $\frac{3}{4}$  millim.

*Hab.* Stations 1 and 5.

This is a very remarkable little creature, and at once recognized

by the peculiarity of one of the arms possessing a double set of suckers.

*LOLIGO PATAGONICA*, sp. n. (Plate III. figs. 2-2 d.)

Body cylindrical, tapering gradually behind, about four times as long as broad. Upper margin produced to an acute point on the dorsal side, broadly sinuated beneath. Fins occupying a little less than half the length of the body, rhomboidal, with the lateral angles only slightly rounded, joining the body without any superior slit. Head a little narrower than the body. Of the arms the upper or dorsal pair are the smallest and shortest, with an acute membranous inner edge. Second pair rather longer and thicker, having the inner or upper edge more rounded than the outer, which is acutely carinate. Third or lower lateral pair largest and longest of all, rounded on the upperside, and bearing a broad membranous expansion on the lower edge extending from the tip to the base, where it joins a similar membrane running up the side of the basal arms. These are nearly as thick as the preceding but rather shorter, and have a very acute carinate inner edge. Cupules on the upper and lower pairs rather smaller than those on the lateral pairs. Horny rings very oblique, furnished on one side with five or six rather squarely cut teeth. Buccal membrane produced into seven prominent lobes, whereof the two subbasal pair are the most conspicuous, within bearing a few minute suckers upon very long pedicles.

Tentacular arms slender, tapering at the ends. Club but little expanded, furnished with four rows of cups, whereof the two inner are vastly larger than the outer; they alternate with each other and also with the small outer cups, so that the latter on one side are on the same transverse line as the more remote series of large ones. The length of the club is about five twelfths of the entire length of the tentacle. The horny ring has about from twenty to twenty-four blunt teeth.

The colour of the two specimens is purplish buff, varied with numerous close-set, generally ovate, largish spots of a purple tint, and of different sizes, upon the back, the sides, and crown of the head. Ventral surface and beneath the fins destitute of spotting.

Shell pennate; shaft thin, roundly keeled exteriorly and grooved on the opposite side; expanded portion or vane rather broad, equalling in this respect rather less than one sixth of the length.

*Dimensions.* Length of body 62 millims., width 14; fins 27 long and 30 in diameter across the back from one lateral angle to the other; tentacles 38 long; longest arm 27.

*Hab.* Alert Harbour, Trinidad Channel, west coast of Patagonia.

Only one species of this genus has been hitherto recorded from the west coast of the South-American continent, namely *Loligo gahi*, found on the Chilian coast. In that species the fins are considerably shorter in proportion to the length of the body, join the back nearer the centre, and have rounded upper and lateral angles. The arms, too, offer certain differences; and the number of teeth on the horny rings of the larger cups on the tentacular club is



greater in *L. gahi*, and their form, judging from the figure of them, more acute.

The form and attachment of the fins to the back are very similar in *L. brasiliensis* and *L. patagonica*. The former, however, is a broader species, has a differently shaped shell, and several other differences.

*ONYCHOTEUTHIS INGENS*, sp. n. (Plate III. figs. 1-1 d.)

*Hab.* Port Riofrio, west coast of Patagonia.

The head only of a species of this genus was sent by Dr. Copinger. It differs in certain particulars from the known species, and is especially interesting on account of its great size.

*Description.* Of the arms, the upper or dorsal pair are most slender and the shortest, the two lateral pairs about equal in thickness, the upper pair having a slight advantage in length, in this respect agreeing with the lower or ventral pair, which, however, are a trifle broader at the base than any. The latter arms have a remarkably broad and almost flat outer surface, and are roundly angled at the margins; the sides are flattened and converge, so that the innerside, likewise flat, becomes but little broader than half the outside; the outer margin is provided with a broad membranous expansion, which apparently extends to the extremity of the arm: it is widest at the base, where it connects the adjoining arm, gradually narrowing towards the tip. Lower lateral pair also furnished with a membrane on the upperside, which, however, is very much the broadest near the middle of the arm. The upper lateral pair are provided with a membrane on the lower side; but it is very narrow; and the dorsal pair are destitute of any. The suckers are arranged in two alternating series, commencing a short distance (about an inch) from the base of the arms. They are subspherical, shortly pedunculated, provided with simple-edged horny rings, largest towards the middle of the arms and gradually diminishing towards the tip, those upon the ventral pair being a trifle smaller than those upon the other arms, and the largest upon the lower lateral pair.

Tentacular arms are in length with respect to the sessile arms as 5 to 3. They are compressedly rounded, thickish, equalling in the greatest diameter the basal arms; they narrow very gradually towards the extremity, with the terminal club scarcely at all widened and occupying just one fifth of the entire length of the arm. Along one side from the base to the end runs a very small membrane. The extremity of the club is much compressed. The hooks are in two alternating series of fourteen each, those of one row being decidedly larger than those of the other, especially the fifth to the tenth hooks, which are very formidable. The cups of the carpal group are ten in number, with about eleven interjacent tubercles, the whole occupying a surface of an elongate-oval form. The cups of the terminal group are thirteen or fourteen in number, and contiguous to one another, and all open, with horny rings.

The horny mandibles are black, the upper one considerably the longer, narrower, and more hooked.

The odontophore consists of sixty-two rows of teeth, each row composed of a transverse series of seven. The central tooth is the largest, having a large acutish central prong and a small subbasal one on each side. The next tooth on either side is considerably smaller, with an acute central fang, and a smaller somewhat hooked one on the outside, and none on the inner. The two outer teeth are long, simple, curved and acute, the outermost having a slight sinuation in the outer curved edge.

The colour of the specimen as preserved in spirit is brownish purple, slightly paler on the inner surface of the arms. The minute dotting so general in this order of Mollusca is scarcely observable in the head before me.

*Dimensions.* Length of tentacles 150 millims., of ventral arms 270.

*Affinities and Differences.* At present only a single species has been described from the Patagonian region. This is the *Onychoteuthis fusiformis* of Gabb<sup>1</sup>, "said to have been caught off Cape Horn." This is a very small animal in comparison with that here described, and, judging from the description, is a distinct species, and not the young form of that now described. The formula of the relative length of the arms is different; and in *O. fusiformis* the lowermost or ventral pair of arms are destitute of a marginal membrane, whilst in *O. ingens* this feature is strongly developed. The cupules are described by Gabb as being "arranged in a double series, without being either in pairs, nor yet alternating;" on the contrary, in the present species they are most regularly alternating. The tentacles have a different proportional length in relation to the club at the end, in the one form (*O. fusiformis*) being as 3 to 1, in the other as 5 to 1. Besides these distinctions, there are probably others, in the number of hooks on the club, the number of the cups at the extremity of it, the presence of tubercula between the cupules of the carpal group, and in the odontophore, all of which are passed over in the description of the Cape-Horn species.

The well known *O. banksii* is also a smaller animal, with compressed lower lateral arms. The formula of relative length is different, the number of hooks on the club smaller, and the cupules of the carpal group fewer; those on the arms, too, differ in form; and the odontophore offers certain distinctions.

## II. GASTROPODA.

### a. Marine.

#### PLEUROTOMA, sp. inc.

*Hab.* Wolsey anchorage, 17 fathoms, brought up on the anchor.

A single dead specimen of a very interesting form. It apparently belongs to the typical group of the genus, with the slit in the middle of the lip. The apex, consisting of one whorl and a half, is large for the size of the shell, and globose. The rest of the whorls have a strong beaded keel round the middle, and a smaller and less distinctly

<sup>1</sup> Proc. Californian Acad. Nat. Sci. 1862, p. 171.

beaded one just beneath the suture. The last whorl has two prominent simple keels round the middle, and indications of one or two below. The canal is short, and the columella tortuous. The colour is probably faded. In its present condition the shell is white, with the exception of the keel at the suture, which has traces of a pale lurid hue. It is 10 millims. in length; but it is questionable if that is the ultimate dimension to which it would attain.

PLEUROTOMA (BELA) CUNNINGHAMI, sp. n. (Plate IV. fig. 1.)

Shell ovately fusiform, turreted, purple brown with pale costæ. Whorls 6-7; the two apical rather large, smooth, rounded; the rest concavely sloping above, curved slightly at the sides, and contracted at the base, strongly plicate and minutely spirally striated. Plicæ or costæ about twelve in number, nearly obsolete at the upper part and not reaching the suture; those on the last whorl attenuate inferiorly and disappear at a shallow furrow around the base; beneath the sulcus is an oblique raised ridge. Aperture oblong, dark purplish brown, occupying about two fifths of the entire length. Columella suberect, rounded, whitish, callous. Sinus distinct, but not deep, situate on the concavity at the top of the labrum. The latter is minutely crenate by the exterior fine striæ. The basal canal is short, wide, and pale at the extreme margin. Length 10 millims., diam. 4, aperture 4 long,  $1\frac{1}{2}$  wide.

Operculum elongate pyriform; nucleus terminal.

*Hab.* Puerto Bueno, 2 to 7 fathoms, rocky bottom, and Station 2.

Some worn specimens of this species were obtained by Dr. Cunningham during the voyage of H.M.S. 'Nassau,' and it is with his name that I feel much pleasure in associating this interesting form. Those collected by Dr. Coppinger are in good condition, and exhibit a well defined superior sinus, which is decidedly deeper than in the boreal types of the *Bela* group of *Pleurotoma*.

PLEUROTOMA (MANGELIA?) COPPINGERI, sp. n. (Plate IV. fig. 2.)

Shell small, elongate, subfusiform, dark purplish brown, paler at the apex. Whorls  $6\frac{1}{2}$ , divided by a deep suture; the first one and a half forming the nucleus, large, semiglobose, smooth; the rest slightly convex and longitudinally ribbed. Costæ stout, broader than the interstices, suberect, a little arcuated; those on the body whorl become obsolete a trifle below the middle, whence downward the whorl is transversely finely striated, the striæ at the extremity being closer together than those above. Aperture small, ovate, occupying about one third of the entire length. Columella arcuate, covered with a thin callosity. Labrum thickened, with a very faint sinus a little below the suture. Basal channel short, distinct, oblique. Length  $6\frac{1}{2}$  millims., diam.  $2\frac{1}{2}$ .

*Hab.* Wolsey anchorage, 17 fathoms, mud and gravel bottom.

Only a single specimen was obtained, which hardly presents the character of the sinus in the labrum satisfactorily.

*LACHESIS MERIDIONALIS*, sp. n. (Plate IV. fig. 3.)

Shell small, whitish, cancellated, turreted. Whorls 6; two apical very large, smooth, convex; the rest also convex, longitudinally ribbed and transversely lirate. Costæ subequal to the interstices, about thirteen on a whorl, finer at the upper end than beneath, where they become almost obsolete. Spiral liræ four in number—one around the lower part of the whorls, bordering the narrow deep suture, and scarcely at all affected by the longitudinal costæ; the three others, of which the two lower are much the more conspicuous and coarsely tuberculous upon the ribs, are situated upon the convex portion of the volutions. Last whorl considerably contracted below the middle, encircled by nine transverse ridges, whereof the four upper correspond to those upon the other whorls, the five lower being simple, non-tuberculous, and finer. Aperture small. Columella obliquely arcuate, roundly subtruncate at the base. Canal short, oblique, feebly recurved. Length  $4\frac{1}{2}$  millims., diam.  $1\frac{1}{2}$ , aperture  $1\frac{1}{4}$  long.

*Hab.* Boija Bay, Straits of Magellan, 20 fathoms, on a bottom composed of dead shells and stones.

This species is remarkable for the large smooth nuclear whorls, the convexity and coarse cancellation of those which follow, its narrow form, and the small size of the aperture; the increase in the width of the volutions is very gradual.

*TROPHON GEVERSIANUS*, Pallas.

*Hab.* Stations 6 and 7.

One specimen from Elizabeth Island is very interesting, as showing the great variation to which this species is subject. It is nearly smooth, displaying no indication of cancellation, and exhibiting only faint transverse grooving.

*TROPHON LACINIATUS*, Martyn.

*Hab.* Stations 1, 2, 7; also Cockle Cove, 2-32 fathoms.

*TROPHON CRISPUS*, Couthouy.

*Hab.* Station 7 and Puerto Bueno, 2-7 fathoms, rocky bottom.

*TROPHON MURICIFORMIS*, King.

*Hab.* Stations 2, 3, and 7; also Puerto Bueno, 2-7 fathoms, bottom rocky.

This species has been described under the names *Fusus liratus*, Couthouy, *F. corrugatus*, Reeve, and *F. albidus*, Philippi; all of these, however, are subsequent to King's description in the 'Zoological Journal' for 1830.

*TROPHON FIMBRIATUS*, Hupé. (Plate IV. fig. 4.)

*Fusus fimbriatus*, Hupé, Gay's Hist. de Chile, vol. viii. p. 165, Atlas, pl. 4. figs. 7-7 b.

Shell fusiform, white. Whorls probably about 8, obliquely sloping above, and rounded somewhat at the lower part, longitu-

dinally plicated, spirally ridged, and everywhere ornamented very beautifully with very numerous close raised lamellæ or lines of growth. The longitudinal folds or costæ are oblique, attenuated above, and rapidly widening inferiorly; they number 9-10 on the penultimate, and about one more on the last whorl, on which, a little below the middle, they become obsolete. The spiral liræ are for the most part of about equal thickness, and vary in number from about 7 to 9 on the upper volutions, and from 16 to 20 on the last; the one at the extremity, which, as it were, forms the cauda, is twice or thrice as thick as the rest. Aperture ovate, white, together with the canal occupying rather more than half the entire length. Columella arcuate above, and of a pale greenish tint. Labrum frilled at the margin. Canal oblique, recurved, rather shorter than the aperture. Length 30 millims., diam. 12; aperture and canal 16 long and 6 wide.

Another specimen is 26 millims. long, 11 broad; and its aperture with the canal has a length of 16 millims., and a width of 6.

Operculum brownish yellow, somewhat ovate, not acute at the nuclear end.

*Hab.* Station 6.

This is a very beautiful species on account of the charming nature of the sculpture, in which respect it resembles *T. crispus* of Couthouy, which, however, is easily distinguished by the very different form of the whorls. The figure in Gay's work represents the costæ narrower and more sharply defined than in the specimens which I identify with this species.

*EUTHRIA ATRATA*, sp. n. (Plate IV. fig. 5.)

Shell ovately fusiform, purplish black. Whorls 7-8; nuclear ones rather large, smooth; the rest convex, with a slight depression at the upper part, longitudinally strongly ribbed and finely spirally striated. Costæ narrow beneath the suture, and vanishing on the last whorl a little below the middle. Aperture less than half the shell in length, ovate, continued beneath into a short, narrowish, oblique deep canal, of the same colour as the exterior. Labrum arcuate, thickened by the last rib, with a small tubercle at the commencement of the canal. Columella covered with a thin enamel, which is whitish inferiorly, arched in the middle. Length 16 millims., diam. 7; aperture 7 long, 3 wide.

*Hab.* Station 5 and Puerto Bueno, 2-7 fathoms, bottom rocky; also Boija Bay, 20 fathoms, on a stony and shelly bottom.

The principal characteristic of this species is the intensity of the purplish-black colouring. Four of the specimens have furnished resting places for a small Hermit-crab.

*EUTHRIA MERIDIONALIS*, sp. n. (Plate IV. fig. 6.)

Shell fusiformly ovate, small, brown, pale at the apex. Whorls 6; apical one smooth, whitish, convex; the rest only slightly convex, longitudinally costate, and transversely sulcate. Suture scarcely oblique, rather deep. Costæ a little slanting, somewhat arcuate, about 14 on the last whorl, which do not attain quite to the

lower extremity. Sulci narrow, rather deep, cutting through the costæ, not nearly as broad as the interstices, 4 to 5 in number on the upper whorls, and about 18 on the last, whereof those around the extremity are finest and closest together. Aperture elongate-ovate, produced beneath into a short, oblique, recurved canal, and equalling about two fifths of the whole length of the shell. Labrum simple, thickened exteriorly by the last rib. Columella covered with a thin, smooth, whitish callosity, arcuate at the middle. Length 9 millims., diam.  $3\frac{1}{3}$ , aperture nearly 4 long and  $1\frac{2}{3}$  broad.

*Hab.* Stations 5 and 7.

There are but two examples of this little species, one not quite mature, and the other at some time inhabited by a Paguroid crustacean. The latter circumstance may to some extent have caused the absorption of any liræ or denticles within the labrum, if such ever existed. The first sulcus beneath the suture cuts off the tops of the costæ, which consequently present the appearance of squarish nodules.

*NASSA (TRITIA) COPPINGERI*, sp. n. (Plate IV. fig. 7.)

Shell ovate, whitish, with a broad purplish-brown band at the top of the whorls, and two others on the last, the upper one around the middle, and the other somewhat below. Whorls 6, a little convex, narrowly tabulated above, with a granulous elathrated sculpture; this consists of longitudinal and transverse ridges: the former are not quite so distinct as the latter, are nodulous at the points of contact, about 18 in number on the penultimate whorl, and about 24 on the last, those near the labrum being closer together than the rest. The spiral ridges are flattened at the top, with the edges sharply defined by the intervening grooves; they are four in number on the upper whorls, and seven on the last; below the seventh the whorl has a rather broad deep sulcation, beneath which comes the raised ridge common to the genus. Aperture nearly half the length of the shell, bluish white, exhibiting the external banding. Columella very arcuate in the middle, covered with a thin white callosity, which projects rather prominently into the aperture towards the base. Labrum not thickened exteriorly, armed within with five liræ. Length  $13\frac{1}{2}$  millims., diam. 7, aperture  $6\frac{1}{2}$  long and  $3\frac{1}{3}$  broad.

Operculum triangularly subcircular, with a few minute serrations on the inner margin towards the nucleus.

*Hab.* Station 3.

Only one specimen of this species was collected. It is remarkable for its coarsely granular surface and the stoutness of the spire.

? *NASSA* (——?) *TÆNIOLATA*, Philippi. (Plate IV. fig. 8.)

*Buccinum tæniolatum*, Phil. Archiv f. Naturgeschichte, 1845, p. 69; Gay's Chile, vol. viii. p. 207, Atlas, pl. 4. figs. 9–9 b.

*Hab.* Stations 2 and 3; "Chonos Is." (Philippi).

There are seven specimens, all immature, which may possibly be the young of this species. They do not, however, present six trans-

verse ridges, but only five, on the upper whorls; they are only slightly rounded, become nodulous on crossing the longitudinal costæ, and are very finely striated in a spiral or transverse direction. The largest example is only 11 millims. long, whilst that described by Philippi had a length of  $16\frac{1}{2}$ .

MONOCEROS CALCAR, Martyn.

*Hab.* Station 1; and Francisco Bay, shallow water.

CONCHOLEPAS PERUVIANA, Lamarck.

*Hab.* Station 4.

RANELLA VEXILLUM, Sowerby.

Synon. *Triton ranelliformis*, King, = *Ranella kingii*, D'Orbigny, perhaps = *R. tumida*, Dunker, and *Bursa (Apollon) proditor*, Frauenfeld.

*Hab.* Tom Bay and Trinidad Channel.

Dunker's *R. tumida* was described from specimens from New Zealand. I have compared series from that country, received from different sources, with several specimens from Patagonia and Chili. The result at present is, that I cannot detect any substantial difference between the two local forms. This is very remarkable, as I am not aware of any other mollusk having been shown to be common to these two localities. The variety (*proditor*) from St. Paul's Island, in the Indian Ocean, is also very closely related to, if not conspecific with, the South-American shell; but the form is a little narrower, and the penultimate whorl is conspicuously broad.

PRIENE MAGELLANICA, Chemnitz.

*Triton cancellatum*, Lamarck.

*Hab.* Puerto Bueno, Trinidad Channel, Tom Bay, and Portland Bay.

This species is included in the list of Japanese *Fusidæ* given by A. Adams in the 'Journal' of the Linn. Soc. 1864, vol. vii. p. 106. Reeve also states that it is found at Kamtschatka; and Carpenter observes (Suppl. Report Moll. West Coast N. A., from the Report Brit. Assoc. 1863, p. 534) that "*P. cancellata* is the Cape-Horn species. Some specimens in alcohol in Sir E. Belcher's collection, however, said to be from Icy Cape, greatly resemble the southern shell." If, indeed, this species inhabits such remote parts of the globe as Japan and the Straits of Magellan, it is most unaccountable.

The operculum is ovate, with an almost terminal nucleus; and the internal scar has a subcentral nucleus, with concentric lines of growth placed obliquely across the surface. The outer marginal thickening is moderately broad.

I think that the Chemnitzian name *magellanica* must be retained for this species. It has priority over the *Murex magellanicus* of Gmelin, which is the *Trophon geversianus* of Pallas; and it appears to me that Lamarck very unnecessarily substituted a fresh name (*Triton cancellatum*) for this species. Besides, Gmelin had already

employed that name for what appears to be a species of *Triton*, judging from the figure cited in Knorr's 'Vergnügen,' vol. ii. t. 27. f. 3.

CERITHIUM (BITTIUM) CÆLATUM, Couthouy.

*Hab.* Boija Bay, 20 fathoms (*Coppinger*); "Orange Harbour, Terra del Fuego" (*Couthouy*).

Of the three series of granules encircling the whorls, the uppermost is the finest, and the lowermost the coarsest.

This species is figured in the Atlas to Wilkes's Exploring Expedition (figs. 174-174 d).

TROCHITA (CLYPEOLA) CORRUGATA, Reeve.

*Hab.* Stations 6 and 7.

To this species probably belong *Trochus pileus*, Lamarek, *Trochatella pileolus*, d'Orbigny, and *Calyptræa costellata*, Philippi.

CREPIPATELLA DILATATA, Lamarek.

*Hab.* Station 5.

These specimens differ from those found more north in being entirely destitute of colour, like *C. pallida*, Broderip; but in other respects there appears to be no difference.

LAMELLARIA PATAGONICA, sp. n. (Plate IV. figs. 9, 9 a, 9 b.)

*Peronia*, sp., Cunningham, Nat. Hist. Straits of Magellan, 1871, plate before p. 75, fig. 1, and p. 449; id. Trans. Linn. Soc. vol. xxvii. p. 484, pl. 58. figs. 4 a-b.

"Mantle of a dirty yellow colour, marked with lines and blotches of light vandyke-brown, and its undersurface around the foot was marked with light-coloured striæ"<sup>1</sup>. Animal high, convex, exhibiting to some extent the form of the shell, owing to the thinness of the mantle which envelops it. Foot somewhat truncate in front, gradually tapering towards the other end, which is rounded. Tentacles shortish. Eyes apparently sessile, situated at the outer bases of the tentacles. The teeth on the lingual ribbon in three series: the central with two equal diverging shanks, joined at the apex, which is recurved, with a small tooth on the middle of the cutting-edge and still smaller ones on each side; the lateral teeth are acute at the tip, recurved, very finely serrate on the outer side, the serration being restricted to the central portion, also with an inner lateral prominence separated in part from the tooth by a sutural line, more strongly serrated than the outer edge, the denticles being apparently seven in number.

From his description it will be seen that the character of the odontophore is very similar to that of *L. producta* (Troschel, 'Gebiss der Schnecken,' i. pl. xvi. fig. 4); but the shanks of the median tooth are not unequal, and the lateral teeth are more hooked at the tips. The horny oral process is composed of two pieces, very similar to those of *L. perspicua* (Troschel, l. c. fig. 1); it is nearly black at

<sup>1</sup> Dr. Cunningham's description from the live animal.



the narrow end, and is  $2\frac{3}{4}$  millims. in length and 2 broad; the portion inserted in the tissue is larger than the exposed part, the line of demarcation being well defined; the exposed tip exhibits parallel lines of growth.

Shell large, very fragile, globose, transparent hyaline, with a slight milky cloudiness, exhibiting very fine striæ of growth. Whorls  $3\frac{1}{2}$ , very convex, and rapidly enlarging, separated by a deep suture. Spire moderately raised. Aperture exceedingly large, wider than long, oblique. Columella very arcuate, visibly perspectively spiral to the apex, coated with an excessively thin callosity. Greatest diam. 25 millims., height (when resting upon the front of the body-whorl and the basal margin of the aperture) 13; aperture  $17\frac{1}{2}$  wide,  $15\frac{1}{2}$  long.

*Hab.* Station 1; Shell Bay (*Cunningham*).

There are two species of *Lamellaria* mentioned by H. & A. Adams (Gen. Rec. Moll. i. p. 201) of which I can find no published descriptions. They are *L. antarctica*, Couthouy, and *L. pratensis* of the same author, either of which names would be very applicable to the species now described.

Dr. Cunningham says:—"The animal possessed the power of shortening and elongating the tentacles. At times it crawled along the sides of the glass, filled with sea-water, in which it was kept, on its large muscular foot, the shape of which underwent constant changes; and at others it floated on the surface of the water, with the foot uppermost."

#### COLLONIA CUNNINGHAMI, sp. n. (Plate IV. figs. 10, 10 a.)

Shell small, subglobose, perforate in the young state, when adult imperforate, of a rose-madder colour. Whorls  $4\frac{1}{2}$ ; apical one whitish, the rest convex and finely spirally striated, also marked with faint oblique lines of growth. Suture rather deep. Last whorl obliquely descending near the lip, somewhat flattened beneath near the centre. Aperture obliquely subcircular, iridescent within. Columella pearly, spread over the umbilicus. Labrum with a narrow pinkish margin within. Height  $4\frac{1}{2}$  millims., greatest diam. 5, smallest diam.  $4\frac{1}{3}$ .

Operculum circular, consisting of six whorls, which are most easily seen on the inner surface. The outside is somewhat thickened by a shelly deposit.

*Hab.* Stations 5 and 2, and Wolsey anchorage, 17 fathoms, mud and gravel bottom.

Named after Dr. R. O. Cunningham, whose labours on the Patagonian fauna are well known and highly appreciated.

#### TROCHUS (PHOTINULA) CÆRULESCENS, King.

*Hab.* Stations 6 and 7.

#### TROCHUS (PHOTINULA) VIOLACEUS, King.

*Hab.* Stations 2, 5, 6, 7, and Puerto Bueno, 2-7 fms.

TROCHUS (CHLOROSTOMA) ATER, Lesson.

*Hab.* Station 4.

TROCHUS (CHLOROSTOMA), sp., jun.

*Hab.* Station 2.

Three specimens, apparently immature, are closely allied to *T. luctuosus*, d'Orb., = *T. bicarinatus*, Pot. & Mich.

TROCHUS (ZIZIPHINUS) CONSIMILIS, sp. n. (Plate IV. fig. 11.)

Shell pyramidal, of a very pretty purplish lilac colour, encircled with pale transverse ridges. Whorls 7; the nuclear one rounded, white; the rest flat, with three to four strong spiral liræ, whereof the uppermost, or the two uppermost, are more or less granulous. The interstices are smooth, with the exception of oblique lines of growth. Suture marked by a thread-like keel. Last whorl acutely angled below the middle, with a flattish base, which has two or three sulci near the angle, and two white or pale lilac liræ encircling the umbilical region. Aperture somewhat obliquely quadrangular; columella pearly, margined with a white callosity. Height 11 millims., greatest diam. of base 9, smallest 8.

*Hab.* Station 5; and Cockle Cove, between tide-marks.

A very pretty species, easily recognized by its colour and sculpture, and recalling to some extent the northern *T. alabastrum*, Beck.

SIPHONARIA LESSONI, jun.

*Hab.* Station 3.

FISSURELLA PICTA, Gmelin.

*Hab.* Stations 3 and 5.

FISSURELLA, ALBA, Philippi.

*Hab.* Station 7.

DENTALIUM, sp.

*Hab.* Station 5.

I am not aware of any species of *Dentalium* having been recorded from this region. The single shell obtained is a dead specimen, quite straight, very slowly enlarging, and exhibiting only lines of increment and no longitudinal striae. It has a length of 29 millims., and is 2 in diameter at the oral orifice.

PATELLA (NACELLA) MYTILINA, Gmelin.

*Hab.* Tom Bay, on rocks at low water.

This variable species was also collected at Kerguelen Island; and in a paper in the 'Philosophical Transactions,' upon the Mollusca collected during the Transit-of-Venus Expedition to that region, I have given comparative remarks upon the different varieties which have been described as distinct species.

PATELLA (PATINELLA) AENEA, Martyn.

*Hab.* Trinidad Channel, on rocks.

*TECTURA* (*PILIDIUM*) *COPPINGERI*, sp. n. (Plate IV. figs. 12, 12 a.)

Shell cap-shaped, thin, sculptured with numerous fine, thread-like, granulous liræ radiating from the apex to the margin, and with fine concentric lines of growth. The colour is dirty white, varied with two or three bands of a pale slate-colour which encircle the shell at irregular intervals, and are interrupted by the radiating liræ, which are white. This feature is more apparent within the shell, where the surface is very smooth and shining. Margin nearly simple, very faintly crenulated by the extremities of the ridges, roundly ovate in form. Apex rather acute, not greatly curved down, and very near the anterior end. Length  $5\frac{1}{3}$  millims., diam.  $4\frac{1}{3}$ , height  $2\frac{1}{2}$ .

*Hab.* Station 7.

This is the southern representative of the northern *Tectura* (*Pilidium*) *fulva* of Müller. It is rather more circular than the latter; and the colour of the single specimen at hand is different.

*CHITON BOWENII*, King.

*Hab.* Cockle Cove, 2-32 fathoms., mud bottom.

*CHITON* (*CALLOCHITON*) *ILLUMINATUS*, Gray.

*Hab.* Station 6.

*CHITON* (*PLAXIPHORA*) *CARMICHAELIS*, Gray.

*Hab.* Stations 3 and 6.

*CHITON* (*TONICIA*) *FASTIGIATUS*, Gray.

*Hab.* Tom Bay, on the shore.

*CHITON* (*ISCHNOCHITON*) *IMITATOR*, sp. n. (Plate IV. figs. 13-13 e.)

Shell elongate ovate, moderately elevated, subangularly arched at the middle, dirty white. Valves narrow, with a single notch on each side, exhibiting small slightly raised lateral areas, which towards the margin have a few transverse strong grooves or marks of growth. Front margin sloping very slightly on each side from the middle in a posterior direction; hind margin straight. Sculpture consisting of close flat granulation, exhibiting a somewhat serial arrangement. Laminæ of insertion very thin, with a wide sinus between them. Anterior valve sculptured like the others, with fourteen fissures within, the thirteen teeth between them being sharp and straight-edged. Posterior valve with a central mucro, from which there is a faint ridge on each side to the lateral extremity, also marked with concentric lines of growth at intervals, and with the inner marginal fissures twelve in number. Scales of the mantle minute, imbricating, ovate, arranged lengthways; under the microscope they appear very coarsely transversely grooved. Length 11 millims., diam. of fourth valve 5.

*Hab.* Tom Bay, on the shore.

This species is very like the northern *C. albus*; and *C. viridulus* of

Couthouy appears to be another closely allied species; but in each instance there are differences in detail of sculpture which may separate the three forms.

*Doris*, sp.

*Hab.* Port Bernejo, at the southern end of Madré Island, W. coast of Patagonia.

A single specimen was obtained by Dr. Coppinger. It closely resembles the British *D. tuberculata*, a species already recorded from Kerguelen's Land.

b. *Terrestrial*.

*HELIX (PATULA) COPPINGERI*, sp. n. (Plate IV. figs. 14, 14a.)

Shell minute, discoid, umbilicated, pale luteous. Spire scarcely raised above the last whorl. Suture deep. Whorls  $3\frac{1}{2}$ , slowly enlarging, ornamented with most delicate slender and close-set costellæ or raised lines of growth, and with very numerous fine spiral elevated lines between the costellæ, visible only under the microscope. Umbilicus moderately small, equalling about  $\frac{1}{6}$  of the basal diameter. Aperture lunate; lip simple. Greatest diam.  $1\frac{2}{3}$  millim., height 1.

*Hab.* Tom Bay, found on a rotten tree.

This minute species is remarkable for the fine riblets and the beautiful spiral sculpture, the latter being vastly finer than the former.

*HELIX (PATULA) MAGELLANICA*, sp. n. (Plate IV. figs. 15-15b.)

This species resembles the preceding in general aspect. The colour is the same; but the whorls increase more rapidly, and are only  $2\frac{1}{2}$  in number. The longitudinal riblets are excessively slender, and both finer and more numerous than in *H. coppingeri*. This species also is without spiral sculpture. Umbilicus rather more open, and the body-whorl beneath narrower than in that species; but above it is broader. Suture the same. Aperture a trifle larger. Diam.  $1\frac{2}{3}$  millim., height 1.

*Hab.* With the preceding.

*H. lyrata*, Couthouy, from Tierra del Fuego, apparently belongs to the same group, and is closely related.

*HELIX (ZONITES ?) ORDINARIA*, sp. n. (Plate IV. figs. 16, 16a.)

Shell small, umbilicated, thin, glossy, discoid, transparent. Whorls  $3\frac{1}{2}$ , convex, margined at the suture, rather slowly enlarging, faintly striated by the lines of growth. The margination of the whorls forms a distinct channel at the suture. Spire depressed, scarcely raised above the last whorl, which is rounded at the periphery. Umbilicus rather open, exhibiting two of the upper volutions. Aperture large, lunate. Peristome thin, simple, a little reflexed at the umbilicus. Greatest diam. 3 millims., height  $1\frac{1}{2}$ .

*Hab.* Tom Bay, attached to the frond of a fern.

Apparently distinct, although a near relation to *H. saxatilis* of Couthouy, from Tierra del Fuego.

*SUCCINEA PATAGONICA*, sp. n. (Plate IV. figs. 17, 17a.)

Shell ovate, somewhat ventricose, greenish yellow, with the apex light scarlet. Whorls 3, very convex; the last somewhat elongated, striated by the lines of growth, and separated by a deepish suture. Mouth ovate, equalling rather more than two thirds of the entire length. Columellar margin obliquely arcuate, with a thinly reflexed enamel extending to the termination of the outer margin. Length  $12\frac{1}{2}$  millims., diam. from lip to opposite side of the whorl 8, aperture 9 long and 6 broad. Another specimen is 9 millims. long,  $6\frac{1}{2}$  broad, and its aperture has a length of  $6\frac{3}{4}$  and a width of 5.

*Hab.* Cockle Cove, found on dead leaves; also shores of Trinidad Channel and Puerto Bueno.

This species is mainly distinguished from *S. magellanica* of Gould by its scarlet apical whorl, the second or penultimate being rather less shouldered; and the suture, too, is scarcely as deep.

c. *Fluvatile.*

*CHILINA AMENA*, sp. n. (Plate IV. figs. 18, 18a.)

Shell very fragile, ovate, acute above, greenish yellow, with transverse bands of dark reddish brown, more or less arrow-head-shaped spots or marks, which sometimes flow into one another from band to band, thus forming longitudinal zigzag streaks. Of these series of spots the body-whorl has five—one immediately beneath the suture, and the others at subequal distances; that which is a little above the middle of the whorl and runs into the suture of the penultimate whorl is, in the eight specimens before me, narrower than the bands immediately above and beneath it. The whorls are well rounded, about six in number, and striated with the lines of growth. Aperture inversely subauriform, coated with a thin bluish-white enamel, but exhibiting the exterior banding, and, as a rule, occupying about  $\frac{2}{3}$  of the entire length of the shell. Columella a little oblique and arcuate, with a single fold at the upper part, white, somewhat reflexed beneath the fold, and with a thin callosity above it. Length 26 millims., diam. 11, aperture  $14\frac{1}{2}$  long and 6 broad.

*Hab.* From a lake near Tom Bay.

The spire in this species is quite as long as in *C. parchappi*, d'Orbigny, from which species it differs in the brightness and distinctness of coloration, the greater convexity and shouldering of the whorls, and the different character of the columella. *C. pulchra*, d'Orb., is more like in colour; but its form is much more stumpy, and the columella and the fold upon it are considerably thicker and heavier than in the present species.

III. CONCHIFERA.

*VENUS*, sp., jun.

*Hab.* Station 2.

Of this species there are two specimens, which apparently are im-

mature. They are of a rounded, somewhat triangular form, radiately finely striated, and with a few concentric raised lamellæ.

VENUS, sp., jun.

*Hab.* Station 2.

Another apparently young form, a little broader than the preceding, without the radiating striæ, and more inequilateral. Both are white.

CHIONE GAYI, Hupé.

*Venus gayi*, Hupé, Gay's *Historia de Chile*, vol. viii. p. 337, Atlas, pl. 6. f. 5 a-c.

Shell trigonally ovate, thickish, a little inequilateral, light brown, rather coarsely concentrically sulcate, and under the lens most minutely radiately striate. Valves moderately convex, white within, very finely crenulated all round the margin, except on the ligamental slope. Teeth in right valve three, central and posterior one bifid and subequal; in left valve three, central one bifid and the largest. Anterior muscular scar elongate, truncated at the upper end; posterior shorter, pyriform. Pallial sinus moderate. Lunule elongate-cordate, defined by deeply incised lines. Diam. 20 millims., length  $16\frac{1}{2}$ , thickness 10.

*Hab.* Station 5; and Boija Bay, 20 fms., on a shelly and stony bottom.

There are four specimens of this simple species, which is considerably like *C. mesodesma* of Quoy and Gaimard.

In d'Orbigny's collection there are two specimens of this species marked, in his own handwriting, "*V. modesta*, Callao, Pérou." These, no doubt, are those which he mentions in the '*Voyage dans l'Amérique méridionale*,' vol. v. p. 563, under the name of *V. cumingi*. Having compared them with the type of *modesta*, Sowerby, for which he substitutes the preceding name, they prove to be totally distinct in form, colour, and sculpture. They exhibit one slight difference from those obtained by Dr. Coppinger. The lunule is brownish red, and on the ligamental slope there are a few irregular angular lines.

CHIONE, sp., jun.

*Hab.* Station 2.

Only a single specimen is in the collection. It is of a transversely oval form, rather strongly concentrically sulcated, whitish, with a purplish stain posterior to the umbo, which is rather excentric.

DIPLODONTA LAMELLATA, sp. n. (Plate V. figs. 1-1c.)

Shell thin, white, transverse, rounded anteriorly, and curvedly truncate behind, exhibiting an obtuse dorsal angle. Valves sculptured with concentric fine raised lamellæ, which are by degrees further apart as they approach the margin; between these very feeble lines of growth are to be seen; near the posterior end there is a slightly depressed portion of the valves. Umbones prominent,

acute. Lunule narrow. Ligamental area lanceolate, twice as long as the ligament. Hinge with two teeth in each valve, whereof the anterior in the right valve and the posterior in the left are bifid. Anterior scar narrow, elongate, running some way from the upper front margin downwards; posterior scar broader, roundly ovate. Pallial line simple, joining the front scar at its upper end. Interior of valves exhibiting an irregular corrugation or punctation. Width  $9\frac{1}{2}$  millims., length 8, thickness  $3\frac{1}{2}$ .

*Hab.* Station 5.

This pretty species is very different from most others of the genus in being sculptured with raised lamellæ.

MACTRA (MULINIA) LEVICARDO, sp. n. (Plate V. figs. 2-2 b.)

Shell ovate, subtrigonal, inequilateral, livid from the centre of the valves to the umbones, elsewhere white, covered with a greyish-olive epidermis. Valves moderately convex, with a faint ridge or angulation from the umbo to the hinder extremity, which is very slightly angulated, and with a shallow depression nearer the dorsal line, marked by a wrinkling of the epidermis. Interior white. The sculpture consists of concentric striæ, very fine near the apex, and rather coarse towards the outer margin. Umbones small, acute, not far apart, situated a little anteriorly. Hinge remarkable on account of the small size of the cartilage-pit; and the whole construction of the hinge is slight. Pallial sinus rather deep, but not acute. Diam. 56 millims., length 44, thickness 22.

*Hab.* Cockle Cove, 7 fathoms., mud.

*M. edulis* of King appears to be the nearest ally of this species, which differs especially in having a much smaller cartilage-pit, a less deep pallial sinus. The form also is more transverse and the dorsal slopes less arcuate, thus giving a more triangular appearance to the outline.

NUCULA PISUM, var.

*Hab.* Station 2.

A single specimen of this species is of a rather narrower and more triangular form than normal examples.

LEDA LUGUBRIS, A. Adams.

*Hab.* Station 2; and Wolsey anchorage, 17 fathoms, mud and gravel.

MALLETTIA MAGELLANICA, Smith. (Plate V. figs. 3, 3 a.)

*Hab.* Station 3, Mayne Harbour, 9 fathoms, greenish mud; and Cockle Cove, 2-32 fathoms, mud.

The typical specimens of this species were collected somewhat south of the above localities at Otter Island. One of those just received is a very fine example, being 38 millims. broad, with a length of 20; and the beaked end is remarkably acute.

SAXICAVA, sp.

*Hab.* Station 7.

There are two apparently young specimens of a species of this genus. They may possibly belong to *S. antarctica*, Philippi, who says ('Archiv für Naturgeschichte,' 1845, p. 52) that it is almost impossible to separate the young of the common Greenland species (*S. arctica*) from the young of the Patagonian form. As far as the character of the shell can determine the species, I confess that the two little specimens from the Straits of Magellan appear to be merely the immature state of the northern shell.

PANDORA (KENNERLIA) BRAZILIENSIS, Gould. (Plate V. figs. 4-4 c.)

*Pandora braziliensis*, Gould, Sowerby, Conch. Icon. pl. 2. f. 15.

Shell somewhat ovate, truncate on the hinge side. *Lower or left valve* deep, convex, thickish, whitish, with a shallow depression from the umbo to the anterior part of the ventral margin, parting off about one sixth of the valve into a sort of wing, which has a less length than rest of the valve; and consequently the ventral margin is interrupted and does not form a regular curve. Down the posterior dorsal slope are three slight keels, situated close together and not far from the edge. Sculpture consisting of coarsish concentric lines of growth; and radiating from the umbo towards the ventral margin a few rather indistinct very slightly elevated ridges may be observed. Interior whitish, pearly, iridescent. Scars small, subcircular, marked with a few transverse concentric layers of growth. Anterior thickening of the hinge-line stout, dentiform, adjoining the front scar, posterior also rather strong and projecting, forming an oblique boundary to the cartilage. The latter is supported or strengthened by a narrow delicate ossicle. *Upper, right, or flat valve* sculptured with fine concentric lines of growth and also with arcuate brown radiating striae. The anterior part is also parted off, as in the lower valve, by an indistinct depression from the apex to the front part of the ventral margin. Posterior dorsal slope nearly at right angles to the rest of the surface of the valve, forming an acute angle. Interior exhibiting about the central portion a few radiating shallow punctured striae. Scars similar to those of the other valve. Teeth two, one very strong, the other thin, narrow, diverging, forming a base for the cartilage. Pearl beautifully iridescent. Width  $21\frac{1}{2}$  millims., length 16, thickness 6.

*Hab.* Station 2.

This species is considerably like *P. wardiana*, A. Adams, from Manchuria; but when closely compared together there appear several differences by which they can be distinguished. The form is not precisely similar; the position of the scars is different; and the dentition is much stronger in the present species, although a smaller shell. As far as I can ascertain, Gould has not published this name; but the valve figured in Sowerby's characteristically slovenly monograph is labelled in the Cumingian collection *P. braziliensis*,



Gould, and agrees exactly with the single shell above described. In assigning *P. wardiana* to Carpenter, and California as its locality, Sowerby has exhibited a great want of care.

*LORIPES PERTENUIS*, sp. n. (Plate V. fig. 5.)

Shell very thin, compressed, obliquely subcircular, white, inequilateral. Valves concentrically finely striated, with a shallow groove running from the umbo down to the posterior end, but at a very little distance from the dorsal margin, and with a second depression bordering the dorsal edge. Umbones acute, rather prominent, situated very much forward. Hinge absolutely toothless. Interior of valves exhibiting traces of iridescence. Width 10 millims., length 9, thickness  $4\frac{1}{2}$ .

*Hab.* Straits of Magellan.

This species is remarkable for its extreme fragility and the shallow depressions down the posterior dorsal slope.

*KELLIA MAGELLANICA*, sp. n. (Plate V. figs. 6-6 b.)

Shell equivalve, subequilateral, white, covered with a yellowish-olive epidermis, for the most part worn off, of an ovate form, a trifle narrowing anteriorly, the outline being interrupted by the prominence of the umbones, rather ventricose. Sculpture consisting of rather coarse concentric lines of growth. Umbones rather acute and prominent, somewhat curved anteriorly. Interior of valves of a bluish white, except at the margin, where the epidermis is narrowly reflexed within. Hinge composed of two stout teeth in the right valve—one immediately beneath the umbo, and the second rather widely separated from it by the intervening cartilage. Also two teeth beneath the apex in the left valve, and a third corresponding to the second tooth in the other valve, also parted off from the others by the internal ligament. Scars and pallial line indistinct; the latter appears quite simple. Width  $8\frac{1}{2}$  millims., length  $7\frac{1}{2}$ , thickness 5.

*Hab.* Station 6.

This species is very much like the British *K. suborbicularis*, yet on close investigation appears distinct. It is more solid, has a stouter epidermis, stronger teeth, and the form is not quite the same. *K. bullata*, Philippi, also a Magellan species, must be very nearly allied to the present; yet the form, as described in the 'Archiv für Naturgeschichte,' appears to differ. *K. magellanica* is almost equilateral, whilst *K. bullata* is said to be "vorn weit länger als hinten."

*ASTARTE MAGELLANICA*, sp. n. (Plate V. fig. 7.)

Shell small, subequilateral, elevated, subpyriform, and not very tumid, concentrically sulcated; beaks prominent, acute, curving considerably anteriorly. Lunule indistinct. The dorsal slope on that side rather incurved, posterior one regularly curved, basal margin broadly arcuate. Concentric waves numerous, close-set, very fine upon the umbones, gradually increasing in stoutness, attenuating at the sides. Epidermis thin, greenish yellow. Interior

dirty whitish, marked with irregular, concentric, subtranslucid zones; impressions shallow, the anterior rather narrower than the posterior; above the former is a second separate minute subcircular pit and a similar one joining the upper margin of the latter. Basal margin of valves minutely dentate within. Teeth of right valve two: the anterior, or that nearest the side towards which the beak curves, very small, conical; the other elongate, bifid. In the other valve two teeth also, the anterior bifid, stouter and shorter than the posterior, which is simple. Anterior dorsal margin of right valve and posterior of the left grooved to receive a thin corresponding elongate lamella on the opposite margins of the respective valves. Length 5 millims., width  $4\frac{1}{2}$ , diameter 2.

*Hab.* Boija Bay, Straits of Magellan, 20 fathoms, on a bottom composed of stones and dead shells.

The discovery of this species in antarctic latitudes is especially interesting, being another instance of the occurrence of a genus in antarctic regions which is peculiarly boreal in its distribution. *A. longirostra*, d'Orbigny, from the Falkland Islands, is allied to this species. It is, however, more beaked, much more finely sculptured, and has a smooth margin to the valves.

CARDITA (ACTINOBOLUS) VELUTINUS, sp. n. (Plate V. fig. 8.)

Shell equivalve, rather inequilateral, globose, as long as broad, whitish, clothed with a thickish velvety pilose dirty brownish epidermis, sculptured with about twenty elevated rounded and somewhat granulous costæ, which are furthest apart anteriorly, and more approximated on the hinder slope of the valves; the interstices are about as broad as the ribs. Umbones prominent, much incurved. Lunule very deep, shortly cordiform. Central tooth in right valve very strong, triangular, striated at the sides. Left valve with a deep central triangular pit, which receives the tooth of the other valve, and a tooth on each side, whereof the anterior is small, rather acute and prominent, and the other elongate, thin, striated on the outer side. Anterior scar elongate, twice as long as broad, posterior much shorter. Margin of the valves dentate within. Interior bluish white near the margin, and feebly tinted with yellow or rose in the concavity. Width 19 millims., length 19, thickness  $14\frac{1}{2}$ .

*Hab.* Station 2; and Wolsey anchorage, 17 fathoms.

*C. spurca*, Sowerby, is the nearest ally of this species. It is, however, of a longer and squarer form; and the epidermis is different.

CARDITA (ACTINOBOLUS) COMPRESSUS, Reeve.

*Hab.* Station 5, and Boija Bay, 20 fms., on a stony and shelly bottom. Valparaiso (Reeve).

CARDITELLA, n. g.

Shell exteriorly like *Cardita*. Hinge composed of two cardinal teeth in the left valve and one in the other. Each valve also has two lateral teeth, one nearly marginal on the one side, the other on the

opposite side being well within the outer edge, with a groove between it and the margin for the reception of the submarginal tooth of the other valve. External ligament small, yet distinct. Internal cartilage *minute*, placed immediately beneath the apex of the valves. Pallial line simple.

To this genus belong *Cardita tegulata*, Reeve, and *C. semen*, Reeve, the former from Valparaiso, the latter from Bolivia.

CARDITELLA PALLIDA, sp. n. (Plate V. figs. 9-9 b.)

Shell triangularly ovate, equilateral, small, compressed, white, clothed with a very thin pale-olive epidermis, with 14 or 15 flatish radiating ribs about twice as broad as the sulci between them; also concentrically sulcated and striated. The fine sulci cut through the costæ, and, being rather close together, produce upon them, toward the ventral margin, transversely oblong granules. Higher up the ribs become narrower, and consequently the granules are not so large or so wide. Interior of valves dentate at the margin. Two lateral teeth in each valve, one marginal, the other within the margin. One cardinal tooth in right valve, and two in the left. Ligament small, external. Also a very minute internal cartilage, immediately below the apex of the umbo. Muscular scars subcircular. Pallial line indistinct, but apparently simple. Length  $4\frac{1}{2}$  millims., diam. 5, thickness  $2\frac{1}{2}$ .

*Hab.* Station 2.

*Cardita flabellum*, Reeve, is almost precisely like this species exteriorly; but the lateral teeth in the former are much more delicate, the internal ligament considerably larger, and the cardinal teeth are not quite the same as in the specimens above described, consisting of a single tooth bordering one side of the cartilage-pit and two diverging ones united above on the other. In addition to these differences, *C. flabellum* has no external ligament. For it I propose the generic name of *Carditopsis*. *C. tegulata*, Reeve, is more inequilateral, less triangular, and has only twelve radiating ribs.

MYTILUS FISCHERIANUS, Tapparone-Canefri, Viaggio della Magenta, p. 138, pl. iv. f. 1-16.

*Hab.* Tom Bay, on a stranded mass of kelp.

Care must be taken not to confound this species with the large Chilean species *M. chorus*, Molina. It differs from it in form very considerably. The greatest width in *M. chorus* is from the dorsal angle to the opposite margin, which is remarkably straight. In the present species, on the other hand, the greatest breadth occurs considerably lower down, and the ventral border exhibits a regular though slight curve. The muscular scars, too, offer excellent differences. The anterior subumbonal is very indistinct and almost apical in *M. chorus*, and that on the opposite or ligamental side is rather remote from the umbo and of a broad ovate form; whilst in *M. fischerianus* the former is very distinct, deep, subtriangular, and more remote from the apex, and the latter is quite narrow and nearer the umbo. The large anterior scar of Molina's species is less

circular at the lower end than that of this species; and the extension of it upward is irregular, there being a part of it which extends at an angle within the valve.

These differences appear constant in the four specimens of *M. fischerianus* and the eleven of *M. chorus* which I have examined. The latter species is figured in Cunningham's 'Natural History of the Straits of Magellan,' on a plate opposite p. 155, under the name of *Mytilus chilensis*. This is not, however, the *M. chilensis*, Hupé. The largest specimen of *M. fischerianus* is 125 millims. long.

MYTILUS, sp., jun.

*Hab.* Station 7.

There are two apparently young shells which I cannot identify with any described species. They are remarkable on account of the great breadth, which is about the same as the length. The sculpture too is very curious; it consists of 15 to 20 very thread-like liræ which radiate from the apex to the outer margin. The texture is thin, semitransparent, bluish white; and the surface is clothed with a thin pale-olive epidermis.

MYTILUS MAGELLANICUS, Chemnitz.

*Hab.* Station 3.

PECTEN PATAGONICUS, King.

*Hab.* Stations 1, 2, 3, 6, and Puerto Bueno, 2-7 fathoms, rocky bottom.

#### BRACHIOPODA.

WALDHEIMIA DILATATA, Lamarck.

*Hab.* Stations 2, 3, 5, 7, and Cockle Cove, 2-32 fathoms, mud.

One of the specimens from Portland Bay is very fine, having a diameter of 50 millims.

WALDHEIMIA MAGELLANICA, Chemnitz.

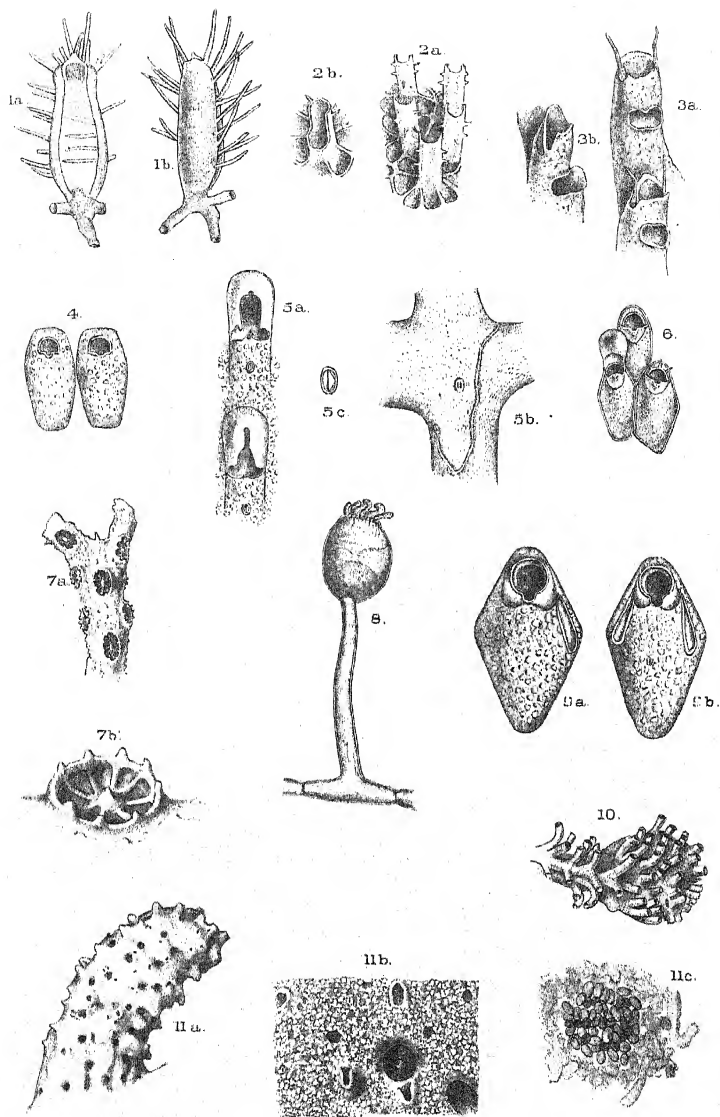
*Hab.* Stations 2, 5, and 7.

#### V. POLYZOA.

By STUART O. RIDLEY.

(Plate VI.)

For the systematic arrangement of the species here described, Mr. Hincks's most valuable recent work on the British Marine Polyzoa has been chiefly followed; the key to the generic relations of the species is therefore to be found there. I have hesitated to name many new species, preferring in some cases to designate as varieties forms which, were the known variability of recent forms and the number of readily identifiable and largely described fossil ones less than they are, would probably have been set down with little doubt as distinct species.



Edwin Wilson del et lith.

Minera Broca. map.



With regard to the fauna of the southern coasts of South America, we have already, in the British Museum Catalogue of 1852-75, had considerable insight into it, thanks chiefly to the collections brought home by Mr. Darwin; and a statement of its richness in its more equatorial parts has been placed on record by the late Dr. Willimoës-Suhm in a preliminary Report<sup>1</sup> on the observations made on the 'Challenger,' referring to dredgings made off the Brazils. This latter statement is fully borne out by the contents of the present valuable collection. A striking instance in point is that of a haul taken at Victoria Bank, off Brazil, of which the Polyzoan contents could be contained in a pill box, but which included seven species, among them several of the relatively bulky species of the genus *Cellepora*, and a representative of a new genus. A few shreds of a thin *Fucus* from Elizabeth Island in the Straits (6 fathoms depth) produced no less than 99 colonies or portions of colonies, representing nine species. In the new species assigned to *Chaunosia*, Busk, we have the interesting case of a fellow being found to a species from across the Atlantic at the opposite mainland, the Cape of Good Hope. Species known as fossils have appeared in the shape of *Cellepora tubigera*, Busk (already known from European seas), and the beautiful *Discoporella grignonensis*, Busk, not previously known in the recent state.

One species (a new one) belongs to the Endoprocta (*Pedicellina*), none to the Ctenostomata; six to the Cyclostomata (of which three are *Tubuliporæ*, one a *Discoporella*, one a *Diastopora*, one an *Idmonea*). Of the Chilostomata but one species of the *Articulata* (Busk, Cat. Mus. Brit.) occurs; the rest, numbering 25 species, belong exclusively to the generally more highly calcified group *Inarticulata* (Busk, *l. c.*). This is rather striking, considering the abundance in which the *Catenicellidæ* and kindred forms occur off Australia; but it serves to draw attention to the fact that the *faunes* of the fauna is Atlantic rather than Australian or Novo-Zelandian.

#### CHILOSTOMATA.

##### CANDA? sp.

A few badly preserved fragments from Victoria Bank<sup>2</sup>, off S.E. Brazil, 39 fms.

##### CHAUNOSIA FRAGILIS, sp. n. (Plate VI. fig. 1.)

*Chaunosia*, Busk, Quart. Journ. Mier. Sci. (n. s.) vii. p. 241.

Zoarium horny, with the exception of the calcareous distal portion of the spines. Zoecia erect, distinct, crowded, each standing at the junction of four uniting branches of the tubular stolon, which is their only point of attachment; somewhat convex behind and at the sides, straight in front, where they appear to lie open by a space of about three fourths of the breadth of the front of the cell; tapering

<sup>1</sup> Proc. Roy. Soc. xxiv. p. 572.

<sup>2</sup> Not marked in the usual maps; its position is lat. 20° 42' S., long. 37° 27' W.

slightly to upper end from short distance above base ; a prominent horny ridge at upper end ; beset at the sides with tubular, partly calcareous, brittle unbranched spines, which show a strong constriction of their internal cavity at the point of junction of the horny and calcareous substances, viz. at about one fifth of their length from the base : about fifteen spines are arranged down each side of the cell. Stolon creeping on foreign bodies. Tentacles between twenty and thirty in number. A gizzard present. No special oocœium observed. Maximum length of zoocœium, exclusive of spines, 1.25 millim., maximum exclusive breadth .5 millim. ; maximum length of spines .7 millim.

*Examined.* From spirit, in glycerine and after treatment with acid.

*Hab.* Sandy Point, 7-10 fathoms. ; on large flexible worm-tube with *Halecium*, *Sertularella*, &c.

*Obs.* This species appears to be distinguished from *C. hirtissima*, Busk, by the unbranched character of the spines, by the sessile form of the colony, replacing the Flustra-like branching of that species ; the cell is also about one third larger than appears to be the size of *C. hirtissima* (although one of the figures given of that species differs in proportion, probably by an error, from the other two), which seems to be about .83 millim. long. The method of basal attachment is not given with sufficient plainness by Busk ; but it appears probable that it resembles that of our species, and that the tubular processes proceed from the base alone, and not from the sides of the cell as in *Diachoris*. The back of the cell is bare of spines, thus differing again from *C. hirtissima*.

It is noticeable that both species are from the South Atlantic, *C. hirtissima* being from the Cape of Good Hope.

#### MEMBRANIPORA LACROIXI, Audouin.

*Flustra lacroixi*, Audouin, in Savigny's 'Egypte.'

*Membranipora lacroixi*, Busk, Cat. Mus. Brit. ii. p. 60, pls. lxi., cix. fig. 1.

The outline of the cells and the calcareous part of the surface corresponds well with pl. lxi. fig. 4 of Busk, Cat. Mar. Polyz. Brit. Mus. ; but it has, besides, pear-shaped apertures surrounded by distinct rims, in the spaces between the cells ; they vary in position ; and there are from one to two at each side of the cell ; other spaces, whose walls are simply formed by the edges of the cells, also occur irregularly. The spine on each side above the mouth is often present.

*Examined.* Dry.

*Hab.* Victoria Bank, S.E. Brazil, 33 fathoms, on *Cellepora*.

#### MEMBRANIPORA CURVIROSTRIS, Hincks.

*Membranipora curvirostris*, Hincks, Ann. & Mag. Nat. Hist. ser. 3, ix. p. 29, pl. vii. fig. 4 ; Hist. Brit. Mar. Polyz. p. 153, pl. xx. figs. 5 and 6.

A small colony on *Fucus* corresponds very well with the latter



description and figures, except that the two oral spines are not observed, that the lamina appears (perhaps delusively) to be often calcified at its margin, and that the oecium has a rather thick front edge, which is mesially pointed.

*Hab.* Hotspur Bank (off Brazilian coast, long.  $35^{\circ} 46'$  W., lat.  $17^{\circ} 32'$  S.), 35 fathoms.

CRIBRILLINA RADIATA, Moll.

"*Eschara radiata*, Moll, Seerinde."

*Cribrellina radiata*, Hincks, Hist. Brit. Mar. Polyz. p. 181, pl. xxv. figs. 1-9.

Of the "form *radiata*" of Hincks, op. cit. p. 188, with glistening surface, and well represented by pl. xxv. fig. 3, op. cit., except that a single pore below the mouth is the rule, instead of the two small ones there represented.

*Hab.* Victoria Bank, off S.E. Brazil, 33 fathoms, on *Cellepora*.

#### GIGANTOPORA, g. n.

Growth encrusting. Zoecias salient, ventricose, minutely roughened and punctured. Above true mouth, which is terminal, not horizontal, is an enlarged tubular prolongation of the peristome directed upwards and outwards, terminated by a secondary aperture; an avicularium or vibraculum at one or both sides of this. On front face of zoecium proper a large roundish special pore at least half as broad transversely as the cell itself.

#### GIGANTOPORA LYNCOIDES, sp. n. (Plate VI. fig. 3.)

Zoecia grouped round a centre, in contact with those in front of and behind them; ventricose, surface glistening, minutely roughened and punctate. Special pore at about middle of front of cell, transversely elongated, with projecting smooth lips, rounded at ends, equal in transverse diameter to at least half that of the cell itself. Peristomial neck ventricose, diminishing in diameter from middle towards the secondary orifice; roughened similarly to the cell; bent forward at an angle of about  $30^{\circ}$ , flattened from front to back; rim thick, prolonged before and behind into angular point; on edge of each lateral depression a pear-shaped opening, in which is inserted a horny vibraculoid seta, ending in a fine point, equal in length to about that of the peristomial neck, projecting straight upwards in same direction as the neck. Oecium small, globose, recumbent at back of cell proper, punctate.

Full length of cell about 1.065 millim., extreme breadth (at lower end) about .532 millim.

*Examined.* In the dry state.

*Hab.* Victoria Bank (off S.E. Brazil), 33 fathoms. On a Nullipore incrusting a small univalve shell, and bearing many strong processes, between which the small zoarium of about 20 cells lies.

*Obs.* Under this genus must also be ranked *Hippothoa fenestrata*, Smitt ("Flor. Bryoz.," Sv. Akad. Handl. xi. No. 4, p. 47, pl. vi.

fig. 142), from Florida and perhaps also the Pacific. Prof. Smitt evidently merely placed the species under *Hippothoa* provisionally. It comes near to the present species, differing from it in the apparently orbicular outline of the secondary orifice, and in the position of the lateral avicularia (of which only one may be present) at the lower end of the peristomial prolongation, and in the smoothness of the peristome. It should therefore stand as *Gigantopora fenestrata*, Smitt. The present new species is a beautiful and striking form; the hyaline character of the shell, the curiously dumbbell-like outline of the large front pore (which is apparently its normal form, though it shows great variations from this, being almost orbicular in some cases) with its distinct rim, the bilabiate aperture of the secondary orifice, and the slender upwardly-projecting vibracula, all give it a remarkable appearance.

The question of affinity is a difficult one. The pore differs from that of *Anarthropora*; and *Smittia*, which has a similar peristomial lip, wants the special pore; while *Microporella*, on the other hand, has the pore, but wants the lip. Probably the pore is a character of much deeper importance than the lip, derived, as Smitt has shown it, by the example of *Porellina* (*Lepralia*) *ciliata*, to be, from the infra-oral sinus. Therefore perhaps it is best to refer it to the *Microporellidae* rather than to the *Escharidae*, with which, however, it would seem to have some points of affinity.

#### PORINA GALEATA, Busk.

*Lepralia galeata*, Busk, Cat. Polyz. Mus. Brit. ii. p. 66, pl. xciv. figs. 1, 2.

*Hab.* Elizabeth Island, Straits of Magellan, 6 fathoms, on thin sea-weed; Sandy Point, 7-10 fathoms, on *Pecten*-valve.

#### SCHIZOPORELLA MARSUPIUM, Macgillivray. (Plate VI. fig. 6.)

*Lepralia marsupium*, Macgillivray, Tr. Phil. Inst. Victoria, pt. i. vol. ix. p. 136.

Zoarium incrusting; cells adnate, radiating in more or less straight lines from a centre. Zoecia distinct, convex, separated by thin raised lines; broad, with sharp inferior lateral angles, rounded above, hyaline; surface glistening, very minutely punctate, and also bearing about 12 very shallow and indistinct pits of small size, scattered. Orifice semilunar, rounded above, with sharp inferior angles, lower lip straight, sinus shallow, rectangular; from 2 to 3 blunt spines round orifice. Below orifice a very distinctly circumscribed semilunar area, entirely occupied by a large and very prominent avicularian rostrum, convex immediately below mouth; opening large, circular, partially visible from above. Ovicell small, subglobular, minutely punctate, hyaline and glistening, marked by concentric lines.

One specimen.

*Hab.* Elizabeth Island, 6 fathoms, on thin seaweed.

*Obs.* This species agrees with *L. marsupium*, Macgillivray, as described from Victoria *in loc. cit.*, in every particular of the short description; but that description is so short as to need the present fuller account. It resembles *Schizoporella* (*Lepralia*) *venusta*, Norman, in many points, but wants the rectangular area above the mouth, with its avicularium.

SCHIZOPORELLA HYALINA, Linné.

*Cellepora hyalina*, Linné, Syst. Nat. (12) p. 1286.

*Schizoporella hyalina*, Hincks, Hist. Brit. Mar. Polyz. p. 271, pl. xviii. fig. 8-10.

(i.) Ordinary form. Nine small colonies, from Elizabeth Island (Straits of Magellan), 6 fathoms, on Fucus. One ditto from Portland Bay (S.W. Chili), 10 fathoms, on Fucus.

(ii.) Var. *tuberculata*, Hincks (Hist. Brit. Mar. Polyz. p. 272) Four small colonies on Fucus, and one of doubtful origin; all from Elizabeth Island, 6 fathoms.

(iii.) Var. *incrassata*, Hincks (*l. c. supra*). Three colonies from Elizabeth Island, 6 fathoms, on Fucus.

SCHIZOPORELLA SPINIFERA, Johnston?

*Lepralia spinifera*, Johnston, Brit. Zooph. (2) p. 324, pl. lvii. fig. 6.

*Schizoporella spinifera*, Hincks, Hist. Brit. Mar. Polyz. p. 241, pl. xxxv. figs. 6-8.

To this species is referred with much doubt a patch of a small-celled incrusting form, with very convex cells; the articulations of 4 or 5 spines, now gone, are seen on the sometimes somewhat raised peristome. Surface covered with indistinct puncta; sinus large and rounded, the margin at its upper angles drawn up into two vertical points. A large median avicularium on a slight elevation just below the mouth, the mandible pointing downwards. No ovicells.

*Hab.* Tom Bay, S.W. Chili, 0-30 fathoms, on dead *Retepora*.

SCHIZOPORELLA? sp.

A glossy, obscurely punctured species without avicularia, with a shallow small sinus, and a short pointed rostrum on the lower edge of the mouth, and 7 to 8 slender spines on the raised peristome; zoecia convex; no oecia. Incrusting.

*Hab.* Same as preceding.

SCHIZOPORELLA LABIOSA, Busk.

*Lepralia labiosa*, Busk, Cat. Polyz. Brit. Mus. p. 82, pl. lxxxiv. figs. 4, 5.

This species should be described as having the surface of the cell either tuberculated regularly around a median ridge, or indented by large, mostly elongated grooves which radiate from a median ridge or bare surface which extends about halfway down the cell from below

the lip. The lip undergoes great variations even in the same colony. In young colonies, and in some parts of old ones, the thickened ridge investing its edge is almost wanting. Again, it may appear from the front either as a straight line, as a two-horned ridge, or as a ridge produced mesially into a single point.

The depth of the grooves of the surface also varies greatly, so that the surface appears either (i.) as beset with round, more or less elongated tubercles arranged round the median ridge, or (ii.) as grooved, the substance between the depressions not being thus divided into tubercles; in some specimens, too, the tuberculation itself is almost obliterated, apparently by thickening layers added from the exterior. As the grooved and tuberculated cells sometimes occur in the same colonies, it is probable that the latter (the only ones originally figured and described), being, as they are, particularly thick-walled specimens, are produced from the former by the thickening of the cell-wall and consequent greater or less obliteration of the spaces (the last stage in this process being the obliteration of the tubercles themselves), owing perhaps to age. (Cf. Hincks on the development of the zoecium, Hist. Brit. Mar. Polyzoa, p. 184, where he explains the origin and changes of the primary ridges and furrows.)

*Hab.* Elizabeth Island, 6 fathoms, incrusting a mass of *Balani* and enveloping stem of *Sertularia*. Sandy Point, 7-10 fathoms, from large flexible worm-tube and *Balanus* on the same.

#### RHYNCHOPORA BISPINOSA, Johnston.

*Lepralia bispinosa*, Johnston, Brit. Zooph. (2) p. 326, pl. lviii. fig. 10.

*Rhynchopora bispinosa*, Hincks, Hist. Brit. Mar. Polyz. p. 385, p. xl. fig. 1.

*Eschara unicornis*, Hutton?, Cat. Mar. Moll. N. Zealand, p. 99.

To this species are referred with some doubt two colonies of *Escharoid* form, consisting of narrow, strap-shaped branching growths, the branches not anastomosing. The denticle within the mouth is very small and sometimes absent; the suboral umbo is often somewhat eccentric, but usually high and truncate; there is sometimes a mound-like swelling bearing an avicularium on the opposite side of the mouth to the umbo; the two supraoral spines are short and often stout; the surface is rough and regularly covered with large punctures and small avicularia (?); the cells are strongly convex and cover both sides of the fronds.

*Hab.* Victoria Bank, off S.E. Brazil, 33 fathoms.

#### LEPRALIA.

*Lepralia* s. str. (as limited by Smitt and Hincks).

LEPRALIA MONOCEROS, Busk, Cat. Polyz. Brit. Mus. p. 72, pl. xciii. figs. 5, 6.

The punctures of the surface generally present a small tubercle

projecting into them from the side, giving them more or less of a crescentic appearance. One specimen, which was taken from the base of a Sponge and grew partially over an *Idmonea*, was bent over on itself, so that the two halves appeared inclined to unite back to back and form an Escharoid frond; but there was a space between them, which was perhaps originally partially filled with the substance of the Sponge.

*Hab.* Elizabeth Island, 6 fathoms; Sandy Point, 7-10 fathoms; on flexible worm-tube and *Balanus* sessile on the same. Also Tom Bay, near Madre de Dios archipelago, 0-30 fathoms, on base of Sponge.

*Obs.* The different specimens vary much in the distinctness of the cells and the number and regularity of the punctures.

LEPRALIA APPRESSA, Busk, var. nov. VINOSA. (Plate VI. fig. 4.)

*Lepralia pertusa*, Manzoni? Sitzungsber. Ak. Wien, lix. (2) p. 520, pl. ii. fig. 11 (Pliocene).

*Lepralia adpressa*, Busk, Cat. Polyz. Brit. Mus. p. 82, pl. cii. figs. 3, 4, pl. ii. fig. 11.

Zoecia distinct, moderately to broadly ovate, or obscurely pentagonal, slightly convex, closely adnate to surface as a compact zoarium. Mouth defined by a slightly salient narrow rim, well arched above, constricted towards lower angles by two rounded processes projecting into the aperture; lower lip entire, somewhat irregular in outline, slightly projecting outwards. Surface of zoecium covered with obscure tubercles, arranged in a series round edge of cell and over the surface, sometimes in transverse series across the cell; surface granular. Colour of zoecia, with the exception of the rim of the mouth (which is white or brownish) and the apices of the tubercles (which appear white), puce (or crimson-purple); colour faint on oldest parts of zoarium. Oecium small, slightly convex, minutely roughened, not tuberculated, subcircular, brownish.

*Hab.* Portland Bay, S.W. Chili, 10 fathoms, on shell of *Crepipatella*.

*Obs.* This species resembles *L. lata*, Busk., and *L. adpressa*, Busk (lately united by Hincks, in Hist. Brit. Mar. Polyzoa, under the latter name), so closely in all essential characters except the colour, that I have hesitated to give it a new appellation. However, as compared with the type specimen of *L. adpressa* and the figures of *L. lata*, the aperture of the mouth is seen to be much less clearly defined, the lower lip being very indistinct, and the mouth is considerably smaller. These characters may be due to thickening of the wall to some extent; but still the colour remains. But as *Lepralia* (*Microporella*, Hincks) *violacea*, Johnst., may vary from dark purple to cream-colour, and *Lepralia* (*Mucronella*, Hincks) *coccinea*, Abild., with age from grey to red, it appears not safe to depend on this alone as a specific character. It is noteworthy that it adheres to the practice of its allies, of growing on a shell.

SMITTIA LANDSBOROVII, Johnston.

*Lepralia landsborovii*, Johnston, Brit. Zooph. (2) i. p. 310, pl. liv. fig. 9.

*Smittia landsborovi*, Hincks, Hist. Brit. Mar. Polyz. p. 341, pl. xlviii. figs. 6-9.

A small colony, or part of one, discovered among an immense number of *Tubuliporeæ*. Sessile. Cells thin, hyaline, punctured all over, oval or narrow-pentagonal; bounding lines faint or absent. Six strong spines on margin. Avicularium small, on lip of mouth, sometimes absent.

*Hab.* Elizabeth Island, 6 fathoms, on *Fucus*.

*Lepralia reticulata*, Macgillivray, Ann. & Mag. Nat. Hist. (1) ix. p. 467.

SMITTIA RETICULATA, Macgillivray?, var.

*Smittia reticulata*, Hincks, Hist. Brit. Mar. Polyz. p. 346, pl. xlviii. figs. 1-5.

Part a of colony. Margin of mouth generally complete below, subjacent denticle seldom seen. Cells outlined by distinct raised line. Oval median avicularium included in an area bounded by a line descending from the sides of the mouth, longitudinal in direction, sometimes absent. Cell equally punctured all over. Spines on border of mouth 4 or 5, the median ones less robust than the lateral ones. Lower lip prominent. Oœcium absent.

*Hab.* Elizabeth Island, 6 fathoms, on *Fucus*.

*Obs.* In the punctuation of the entire surface and in the larger number of spines this appears to differ materially from *S. reticulata*, but it is at any rate closely allied to it.

SMITTIA AFFINIS, Hincks, var. nov. ACUMINATA.

*Lepralia affinis*, Hincks, Ann. & Mag. N. H. (3) ix. p. 206, pl. xii. fig. 2.

*Smittia affinis*, Hincks, Hist. Brit. Mar. Polyzoa, p. 348, pl. xlix. figs. 10, 11.

Zoœcia ovate or distinctly pentagonal (the upper angles rounded), separated by slender raised lines; surface covered with moderately large punctures radiating obscurely from centre; peristome thin and depressed below, thick above, where 4 to 5 strong spines spring from it; below and within inferior edge of peristome 3 denticles, the median one generally hammer-shaped, the others simply acute. A circular avicularium may be present immediately below the lower lip, on a slightly raised boss. Oœcia globose, somewhat more broad than long, with a semicircular crown of large punctures on the upper surface; the peristome is prolonged into a pointed lip on each side of the front of the cell (similar ones sometimes occur in the same position in the zoœcium), and is often indented by a sinus which occurs in its lip. One of the zoaria forms a circular patch; the other is imperfect. The specimens agree in all other points with Hincks's description (*l. c.*).

*Hab.* Elizabeth Island, 6 fathoms, on *Fucus*, in company with *Schizoporella hyalina*. Two colonies.

*Obs.* Were it not for the fact that only one specimen of the original species has occurred on which to base its characters, it would have seemed advisable to make a new species of this, in consideration of its being spined.

*SMITTIA TRISPINOSA*, Johnston, var. nov. *LIGULATA*. (Plate VI. fig. 9.)

*Discopora trispinosa*, Johnston, Edin. Phil. Journ. xiii. p. 222.

*Lepralia trispinosa*, Busk, Cat. Brit. Mus. Polyzoa, ii. p. 70,

*Smittia trispinosa*, Hincks, Hist. Brit. Mar. Polyzoa, p. 353, pl. xlix. figs. 1-8.

A yellowish patch embracing the base of a colony of a branching *Cellepora*. The cells are markedly diamond-shaped; the surface is much perforated, a marginal series of larger perforations being distinguishable from the rest; a raised line is irregularly present around the cells. The lower side of the mouth is much raised, each of the inferior angles being occupied by a smooth swelling, often of different sizes on the two sides; sinus small. A very peculiar, long, narrow, strap-shaped avicularium extends from close to one or both sides of the mouth downwards to a distance of about half the total length of the cell; the mandible points downwards; a few elongated or oval small avicularia sometimes present on the sides or behind the mouth. Surface hyaline. Ovicell globular, but flattened, upper edge bearing a semicircle of large punctures. Spines absent or broken off.

*Hab.* Victoria Bank, off S.E. Brazil, 33 fathoms, on *Cellepora*.

*Obs.* The long avicularium described evidently represents the large triangular form described by Hincks (*l. c.*) as sometimes present; for it is sometimes replaced by such a one of almost the normal characters. A similarly placed but generally broader form occurs in a specimen described as *Lepralia reticulata*, var. *inæqualis*, by Mr. A. W. Waters, from Naples.

*RETEPORA CELLULOSA*, Oken?

*Fron dipora cellulosa*, Oken? "Lehrbuch Nat. 63."

*Retepora cellulosa*, Lamarck, Hist. Anim. s. Vert. ed. 2, ii. p. 276.

A small and worn fragment without occia perhaps represents this species; but spines and long rostrum are alike absent. Most cells, however, could not have had a long rostrum, but are in the condition represented by plate cxxiii. fig. 7 of the Brit.-Mus. Catalogue of Polyzoa, vol. ii., with the addition of avicularia.

*Hab.* Borja Bay (north-western part of Straits of Magellan), 20 fathoms.

*RETEPORA ALTISULCATA*, sp. n. (Plate VI. fig. 5.)

Fron flattish, slightly undulated; fenestræ elongate-oval, generally about equal in diameter to the reticulations, which are almost cylindrical. Zoœcia crowded, oblong. Surface marked with

shallow pits. Mouth entire, transversely elongated, subhorizontal, the lower lip being salient but not toothed. A round avicularium below or on the edge of mouth, on a small rostrum.

Occium elongate, with a deep broad sinus penetrating into it from the mouth. Dorsal surface minutely roughened, but shining; the outlines of the cells marked by shallow grooves; a small rounded avicularium on most cells.

*Hab.* Tom Bay, S.W. Chili, 0-30 fathoms.

Six broken fragments, probably all belonging to one colony, represent the species. It is distinguished from *R. beaniana*, King (Hincks), by the sinus (not a slit) of the ovicell, and by the inconstancy of the position of the suboral rostrum, which is most usually separated by a considerable gap from the mouth.

CELLEPORA TUBIGERA, Busk.

*Cellepora tubigera*, Busk, Crag Polyzoa (Mon. Palæont. Soc.), p. 60, pl. ix. figs. 8, 10.

The sinus of the mouth is sometimes small and on a level with the mouth (as in *Lepralia trispinosa*, Johnston, &c.); otherwise it forms a great vertical gap in the peristome. The rostrum is sometimes pointed and bearing an avicularium on its inner aspect (as in *C. pumicosa*), sometimes broad at the apex; it is sometimes placed laterally with regard to the cell, and sometimes at some distance from it. The cells are rough or smooth, much or little punctured. The ovicells are globose, smooth, with a few slight ridges running usually across their breadth, or with a crown of punctures on the upper surface from which radiate slight ridges. There are large long avicularia between the cells, generally on special raised but flattened bosses. Two young and nine adult colonies occur in this collection, embracing Sertularian and Tubularian stems, exactly after the manner of *C. pumicosa*.

*Hab.* Trinidad Channel (off Madre-de-Dios Islands), S.W. Chili. One group, consisting of one young and two adult colonies, from 30 fathoms; for the rest the depth is not known. All on Sertularian stems, with one doubtful exception.

CELLEPORA BILABIATA, Busk.

*Cellepora bilabiata*, Busk, Voy. of Rattlesnake, p. 382.

Two colonies, one forming almost a perfect hemisphere, the other flattened, uneven. Both lips of the elevated peristome sometimes bear avicularia. From the "scutiform area" (which is really formed, as shown by varieties, from a sinus which once extended into it from the mouth) of the small ovicell no grooves appear to extend in this case. The species is nearly related to *C. tubigera*, Busk.

*Hab.* Elizabeth Island, 6 fathoms.

CELLEPORA MAMMILLATA, Busk.

*Cellepora mammillata*, Busk, Cat. Mar. Polyz. Brit. Mus. p. 87, pl. xx. figs. 3-5.

The specimen, which, owing to its growth over a pedicelled knob



of calcareous substance, is button-like in shape, agrees in its mammillation with the type specimen, but, instead of being white or grey, is dark brown, almost of the colour of *C. fusca*, Busk. It differs from the type in not showing the hood-like enlargements of the rostrum (possibly oœcia) which occur "at intervals in that specimen; the rostra taper elegantly to a point, instead of being blunt; the spines, described as at the opposite side of the mouth, and which appear to be "spathulate" avicularian rostra, are present in much greater numbers here, and generally at the *sides* of the mouth—not at the opposite end to the rostrum. The surface of the cell is perforated by immense numbers of small punctures with regularity; this is also the case in the type specimen, though not described or figured in *loc. cit.* As the original specimen has somewhat the appearance of having been partially bleached, its original colour very likely approximated to that of the specimen now described.

*Hab.* Victoria Bank, off S.E. Brazil, 33 fathoms.

CELLEPORA TURRITA, Smitt.

*Lepralia turrita*, Smitt, Floridan Bryozoa, in K. Svensk. Akad. Handl. (n. s.) xi. p. 65, pl. xi. figs. 226–228.

A single specimen, consisting of a stout cylindrical branch with incipient smaller branches, 17 millims. long by 5 in greatest breadth, stout, tapering to a blunt point. The number of distinct marginal tuberosities varies from two to four; and they are unequal in size, one being generally of especial stoutness; and one, a mere inequality, bears a horizontal avicularium of some size; the large strong spatulate avicularia are numerous in the somewhat large spines between the zoœcia, and occasional small sessile ones occur in the walls of the cells; the ovicells, which are numerous, bear small scattered punctures.

This form differs somewhat from Smitt's specimens, chiefly in the ramose instead of sessile habit; the cells appear to be less crowded, and the number of spines less constant, while the marginal avicularium forms a constant character.

*Hab.* Victoria Bank, off S.E. Brazil, 33 fathoms; broken from larger colony.

CELLEPORA DICHOTOMA, Hincks.

*Cellepora dichotoma*, Hincks, Ann. N. H. ser. 3, ix. p. 305, pl. xii. figs. 7, 8.

Two specimens, respectively about  $\frac{1}{2}$  and  $\frac{3}{4}$  inch high. The smaller is the more slender, and shows approximately dichotomous branching; the other is less regular. In the smaller one the margin of the mouth is well defined, though sometimes produced into a few points besides the low rostrum; the avicularia are circular and slightly elevated. In the larger specimen the projections round the mouth are longer, and the avicularia are sometimes spatulate.

*Hab.* Victoria Bank, S.E. Brazil, 33 fathoms.

## CYCLOSTOMATA.

## IDMONEA MILNEANA, d'Orbigny.

*Idmonea milneana*, d'Orbigny, Voy. Amér. mérid. p. 20, pl. ix. figs. 17-21; Busk, Cat. Mar. Polyz. Brit. Mus. pt. iii. p. 12, pl. xi.

*Tubulipora transversa*, Lamarck?, Anim. s. Vert. (1) ii. p. 162.

*Idmonea transversa*, M.-Edwards?, Ann. Sci. Nat. (2) ix. p. 218, pl. ix. fig. 3.

This is certainly the species described and figured by Busk. His description requires emendation by the substitution of "thin" for "thick" as a character of the margin of the cells, and by the insertion of "a long backwardly directed spine on the back of the main and sometimes of the smaller branches." One such spine, and perhaps the trace of another, broken off, occurs on the specimens already in the Museum. In the two relatively smaller specimens in *this* collection they are more abundant; in one case the two primary divisions of the stem each bears one; and of their branches, one of the one and *both* of the other bear them. They are strong; and the maximum length appears to be about 3 millims. As pointed out by Haswell (Proc. Linn. Soc. N. S. Wales, iv. p. 351) in a specimen assigned by him with doubt to this species, the "dots" of Busk's description are certainly *raised*. But the truth lies between the two; for they are also perforated in their centre in the original British-Museum specimen and the Magellan one. The alternating character of the lateral series of cells, which is very slightly marked in the Patagonian specimens alluded to (from which the account in the British-Museum Catalogue was in part written), and which is almost lost sight of in d'Orbigny's account, is here strongly marked. The longitudinal striation and the concentric lines on the back are also well marked here.

*Hab.* Tom Bay, near Madre-de-Dios Islands, S.W. Chili, 0-30 fathoms, embedded in base of a horny Sponge, partially overgrown by *Lepralia monoceros* and a creeping calcareous Sponge.

*Obs.* This may possibly prove, as Busk says, to be *I. transversa*, Milne-Edwards; but the habit of growth as figured by M.-Edwards, and the locality (Mediterranean) as given by Lamarck, are against the idea.

Smitt, in his 'Floridan Bryozoa,' remarks on this species that the typical number of cells in the transverse rows is *three*, varying to two or even one in the lower parts. In the present specimens the number never falls below three, and is as often four as three, if not oftener. He has also observed "radiciform pillars" at the back of the branches of one of his specimens; but there their ends were expanded into clasping processes and attached it to a foreign body, whereas in the Chilean specimen they end simply.

## DIASTOPORA PATINA, Lamarck.

*Tubulipora patina*, Lamarck, Anim. s. Vert. (2) ii. p. 244.

*Diastopora patina*, Smitt. Œfv. K. Vetens. Ak. Förh. 1866, p. 397, pl. viii. figs. 13-15.

The erect portion of the cell appears to be obscurely annulated, a very slight annular depression connecting the serially arranged puncta. A somewhat injured dry specimen on indurated clay.

*Hab.* Lat. 50° 35' S., long. 66° 31' W. (open sea off S.E. Patagonia), 58 fathoms.

LICHENOPORA GRIGNONENSIS, Busk. (Plate VI. fig. 2.)

*Tubulipora grignonensis*, Milne-Edwards?, Mém. Tubulipores, Ann. Sci. Nat. (2) viii. p. 333, pl. xiii. fig. 2.

*Discoporella grignonensis*, Busk, Crag Polyzoa, p. 116, pl. xx. fig. 4.

*Lichenopora*, DeFrance; Hincks, Hist. Brit. Mar. Polyz. p. 471.

Zoarium simple, closely adnate. Lamina very narrow, thin, almost entirely occupied by ridges indicating rudimentary zoecia. Zoarium strongly convex from the centre to the lamina, circular in outline. Zoecia partially arranged in radiating series (the series generally interrupted by the occurrence of intermediate cells) around a small central space; orifices raised, considerably so near the centre; the entire front of the peristome wanting, posterior part horseshoe-shaped, margin obscurely roughened; sides faintly ridged longitudinally, and bearing from three to about ten scattered delicate pointed spines not exceeding half the diameter of the cell in length. Interspaces between zoecia and the central area crossed by a network of trabeculae, enclosing polygonal spaces with rounded angles; those between the zoecia vary in diameter from one half the breadth to the same breadth, that of the orifices of the zoecia, those in the centre varying from that diameter to twice its size, and partially tympanized by a calcareous septum with a central perforation; also from the points of junction of the trabeculae which form them projects occasionally a slender spine like those on the walls of the zoecia. Oœcial orifice slightly raised, being surrounded by a thin, narrow, forwardly sloping rim perforated by a single circle of about six small punctures; diameter of opening about twice that of a zoecium; margin finely dentate.

*Hab.* Sandy Point, 9-10 fathoms, on piece of a Selachian's egg.

Four colonies occur, representing three different stages, the latest with fifty-three or more well-developed zoœcial openings, the earliest with only about a dozen openings, scarcely raised above the general surface, the lamina being about twice as broad as in the oldest specimen. In this young specimen, too, the cancelli have hardly appeared, the surface between the cells bearing only an occasional puncture. The development of the spines can be traced from a stage in which they are mere short blunt tubercles to that in which they have the adult proportions. It is also interesting to note that in the same stage (the middle one of the three here represented), in which the zoecia are 2 millims. in greatest diameter, the longitudinal ridges, so indistinct in the oldest specimen, project boldly from the zoœcial wall and sometimes form prominent crenations on the margin. The three young colonies have a somewhat oval outline; the older

one is almost perfectly circular ; it is  $2\frac{1}{2}$  millims. in diameter, the youngest is 1 millim. in greatest diameter.

*Obs.* The nearest recent ally of this species appears to be *Disco-porella complicata*, Haswell (Proc. Linn. Soc. N. S. W. iv. p. 354), from Port Jackson, New South Wales. It has the spines on the wall of the cell and the trabeculae with *their* spines ; but the spines are apparently found also between the cells. Its main points of difference from this species are the roundness of the cell-orifice, which has the peristome entire, and the presence of secondary cancelli between the cancelli of the sides, of which no trace occurs here, though, as has been described for this species, the central cancelli are partially tympanized and have a secondary opening below.

In spite of the absence in the somewhat too small drawing given by Milne-Edwards (*l. c.*) of the immense sinus which extends down the front of the cell in the recent specimens, it is possible that his species is identical with the present one, as with the power employed by him it would not necessarily catch the eye. The median cycles of tubes are depicted there as longer than in the recent specimens ; but that is probably due to its being an older specimen. The peculiar trabeculated structure of the surface is slightly indicated in his figure, and the continuation of the rudimentary tubes onto the lamina is distinctly insisted upon. Busk's figures give a much better idea of this species : but here again the trabeculae between the cells are much broader than in the recent specimen. The marginal spines of the young cell probably represent the longer peristomial spines of adult specimens of *L. hispida*, Fleming.

#### TUBULIPORA SERPENS, Linné.

*Tubulipora serpens*, Linné, Syst. Nat. (12) p. 1271.

*Alecto disposita*, Hutton?, Cat. Mar. Mollusca N. Z. p. 103.

*Tubulipora serpens*, Busk, Cat. Polyz. Brit. Mus. iii. p. 25, pl. xxii.

*Idmonea serpens*, Hineks, Hist. Brit. Mar. Polyz. p. 453, pl. lxi. figs. 2, 3, pl. lx. fig. 2.

Sometimes with a small bare lamina outside the zoecia. No purple colour observed. Colour dead white, owing to the very numerous minute punctures.

*Hab.* Elizabeth Island, Straits of Magellan, 6 fathoms ; twenty-five colonies or parts of colonies on a thin *Fucus*.

#### TUBULIPORA ORGANIZANS, d'Orbigny ?

*Tubulipora organizans* d'Orbigny, Voy. Amér. mérid. Zooph. p. 19, pl. ix. figs. 1-3.

*Tubulipora organizans*, Busk?, Phil. Trans. clxviii. p. 193, pl. x. figs. 20-25.

This species appears to be represented by eighteen colonies or parts of colonies ; they consist of broad elongated masses, either simple or with branches of the same character given off laterally or grouped round a common centre. The largest colony measures 8 millims. at its greatest length. The lobes consist each of a broad flattened mar-

ginal portion and a suddenly rising median convex ridge, which only occupies about one third of the total breadth of the lobe. A clear space of about the breadth of a single cell is left down the middle of the lobes; and on each side of it are ranged the regular, outwardly and forwardly diverging transverse lines of cells. These lines are slightly but constantly subalternate, the line on the one side being slightly in advance of or behind the corresponding one on the other. The transverse lines on each side have from three to five cells on the ridge and one or two on the horizontal lamina. The cells project by a long perpendicular portion; they are subopaque and white, the surface faintly marked with rings of growth; the punctures are small and numerous and not prominent. The cells on the ridge are variously united together, either three or two together, but occasionally quite distinct; those on the lamina are distinct from those of the ridge, and from each other. In the case of the united cells the uniting substance connects them generally from their mouths downwards. The transverse series of cells are *uniserial*, and present no such trifoliate outline as is given by d'Orbigny's figures 2 and 3, from which the present species also diverges by having a distinct median line devoid of cells, as described above. A short trumpet-shaped opening, observed near the end of a lobe, and somewhat flattened, its long diameter being about twice that of an ordinary cell, appears to represent the oöcial opening. The ends of the lobes are not expanded as in *T. flabellaris* (Busk).

This species does not correspond closely with d'Orbigny's figures; but the chief difference is the linear, not trifoliate arrangement of the triple groups of cells.

*Hab.* Elizabeth Island, 6 fathoms, on *Fucus*, with *Tubulipora serpens*, *Schizoporella hyalina*, and one or two other species of *Tubulipora*, &c.

**TUBULIPORA DICHOTOMA**, d'Orbigny. var. nov. SERIALIS. (Plate VI. fig. 10.)

*Criserpia dichotoma*, d'Orbigny, pars, Voy. Amér. mérid., Zooph. p. 19, pl. ix. figs. 7-10.

*Tubulipora dichotoma*, Busk, Cat. Polyz. Brit. Mus. iii. p. 27.

*Tubulipora organizans*, Busk, Phil. Trans. clxviii. p. 193, pl. x. figs. 20-25 (pars?).

Colony convex, elongated, dichotomously branched or incipiently symmetrically bifid; lobes rising from base with hardly any lateral lamina; cells extending across top of ridge, arranged in more or less distinct transverse rows, cells distinct (rarely two may be seen joined) from one another. Surface of colony subopaque, white, thickly covered with minute punctures surrounded by salient rims, the cells less thickly covered by similar punctures. Cells moderately thin, curving suddenly upward so as to stand almost perpendicular, free for a distance of from 3 to 5 diameters; opaque white, of moderate diameter, faintly marked by concentric rings. Ends of lobes more or less expanded and often swollen; at this part the tubes lose most of their regular radiate arrangement.

*Hab.* Elizabeth Island, Straits of Magellan, 6 fathoms, on Fucus. Three colonies or parts of colonies.

*Obs.* In some specimens the regularity of the arrangement of the cells in transverse rows and the length of the free portion of the cells is greater than in others. The most characteristic points appear to be the moderate expansion of the head of the lobes, the continuation of the transverse series of cells over the top of the ridge and consequent absence of a median bare line, and the distinctness of the cells in the rows. D'Orbigny's figures represent the form with the shorter cells and less regular transverse series of cells; the alternative form here described may be called var. *serialis* in contrast. A specimen assigned with doubt to this species consists of a broad expanded lobe, and bears a flattened trumpet-shaped oocelial orifice having exactly the characters of that described above in *P. organizans*, d'Orbigny.

#### ENDOPROCTA.

##### PEDICELLINA AUSTRALIS, sp. n. (Plate VI. fig. 8.)

Individuals arranged with great regularity along the creeping stolon, 1.8 millim. apart from each other. Length of pedicel and body together about 2.5 millims., body 1 millim. Tentacles about 12 in number, subequal, length about half that of body, slender. Pedicel, diameter (in glycerine, under cover-glass) just above base .35 millim., tapering to about .25 when within 3 diameters of the body, ultimately constricted to .1 millim. at junction with body. Body subtransparent. Colour whitish, with the exception of the stomach, which is yellowish. Shape of body subglobular when closed, superior margin straight and crenated by about 60 small inequalities.

Stolon regular in its diameter, viz. .17 millim. A transverse septum, of which, as in the case of that of the pedicel just below the body, the cuticle forms a part, occurs at each side of the point of origin of an individual, generally at about .5 millim. from this.

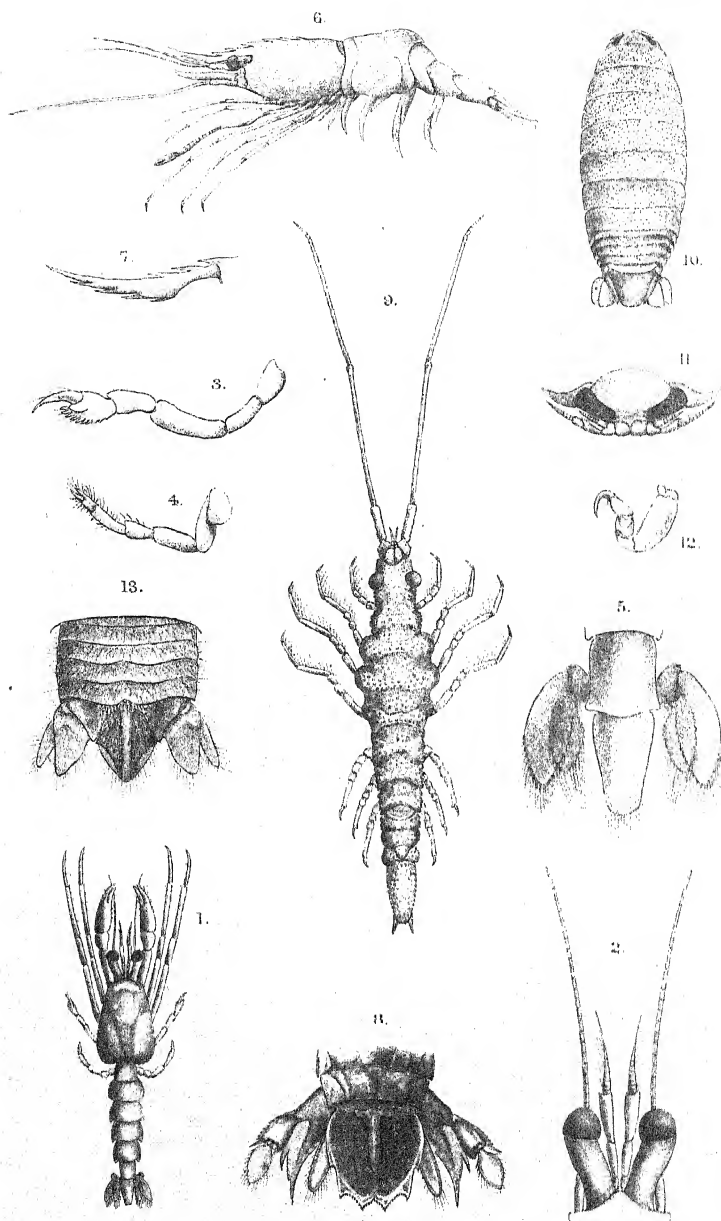
*Examined.* In spirit and in glycerine.

*Hab.* Sandy Point, in company with a *Halecium*, creeping over large flexible worm-tube, 7-10 fathoms.

*Obs.* About a square inch or  $1\frac{1}{2}$  inch of the tube is covered by the creeping stolon; the specimens are very well preserved in spirit; but, unfortunately, the individuals are all more or less closed. In the cases in which the tentacles were extended, the disk was not expanded; so that the origin of the tentacles from it was not clearly seen. It is perhaps most closely allied to *P. americana*, Leidy, but approaches most nearly to *P. belgica*, Van Beneden, of any of the European species, as far as the account of that species goes.

It differs from the latter species in the proportional length of the tentacles to the body, which is only about 1:2, as against the almost 1:1 of that species; in the proportional shortness of the pedicel to the body, which is 1.5 millim. to 1 millim. against 2.85 millims. to .55 millim., which is the case in *P. belgica*. The individuals are 1.8 millim. from each other, arranged along the tubular stolon, and not





A. Hammond del.

Winters Bros. imp.



crowded into a "moss"-like tuft as in *P. belgica*. The absolute total length is nearly one third less than that of *P. belgica*; the stolon is of regular diameter. There is no median dilatation of the pedicel. The description of *P. americana*, Leidy (J. Ac. Philad. iii. p. 142) recalls in some particulars the present form, viz. its smooth undilated pedicels, the body with crenated border concentrically striated, and the 12 tentacles; but it is only  $\frac{1}{3}$  of a line high, i. e. about .7 millim., whereas this is 1.5 millim. without the head; the relative positions of the intestine and stomach in the figure differ from those of our species.

The species described by Studer from Kerguelen Island (Archiv f. Naturg. 1878, p. 124) as "*Pedicellina* an nov. sp? Die Wnder der 2 mm. hohen gestielten Becher sind vollkommen glatt" is very likely identical with *P. australis*. A species is also mentioned without name by Joliet (Compt. Rend. 1879, Febr., p. 392), from the island of St. Paul, north-east of Kerguelen Island.

## CRUSTACEA.

By EDWARD J. MIERS, F.L.S., F.Z.S.

(Plate VII.)

The Crustacean fauna of the Straits of Magellan and of the adjacent coasts and islands has been more thoroughly investigated than that of many other parts of the South-American continent, as, not to mention various species described by Gurin-Mneville, Milne-Edwards, White, and other authors, considerable collections were made in these regions by the naturalists of the United-States Exploring Expedition under Commodore Wilkes, U.S.N., and described by Dana in his great work<sup>1</sup>. More recently Dr. Cunningham has published an account of the collections made by him during the voyage of H.M.S. 'Nassau,' wherein will be found a list, accompanied by notes, of the Crustacea and Cirripedia, most of which were collected on the southern, south-eastern, and south-western American coasts<sup>2</sup>.

The collection received from Dr. Coppinger contains, as was to be anticipated, many species well known to science, but also several which are apparently undescribed, and others of which the range has not hitherto been ascertained to extend in a southerly direction as far as the Magellan Straits; moreover the localities, depth of water, and the nature of the sea-bottom have in nearly all cases been carefully noted.

The Crustacea of the Magellan Straits are essentially Antarctic in character: many of the species are known to occur at New Zealand, the Auckland and Kerguelen Islands, and, no doubt, range throughout the whole extent of the Southern Ocean; others, however, occur on the Chilian coast or even further north. Although the Crustacea

<sup>1</sup> U.S. Exploring Expedition, xiii., xiv., Crustacea, parts 1, 2 (1852, 1853).

<sup>2</sup> Trans. Linn. Soc. xxvii. p. 465 (1871).

of Antarctic South America bear a great resemblance to those of the Arctic Seas, and are in many cases congeneric with them, with a few somewhat doubtful exceptions the same species do not occur in the Northern and Southern seas<sup>1</sup>.

<sup>1</sup> See, however, Lilljeborg, *Nova Acta Soc. Upsaliensis*, ser. 3, vi. (1866), "On the *Lysianassa magellanica*, M.-Edwards, &c." I may add that Mr. T. W. Kirk, *Transactions New-Zealand Institute*, xi. pp. 302-401 (1878), has recently identified several Decapoda and Ecdiophthalamia occurring in the New-Zealand seas with well-known North-European species; but his identifications seem to me to require confirmation, as it is not stated whether they have been made after comparison with European examples or from the descriptions of authors only. Yet more recently, Mr. G. M. Thomson (*Ann. & Mag. Nat. Hist.* vi. p. 4, 1880) has described a variety of the Arctic *Eusirus cuspidatus* (which does not differ sufficiently to be distinguished specifically) from Dunedin Harbour, New Zealand.

Besides the Crustacea obtained on the South-American coasts, the following species were dredged by Dr. Coppinger in the North Atlantic. Amongst them is one apparently new to science, belonging to the very interesting genus *Glaucothoe* of Milne-Edwards, a genus previously unrepresented in the British-Museum collection, and which, although Macruran in its organization, and placed by Milne-Edwards and Dana in the Thalassinidea, presents many affinities with the Paguridea, and is allied to the genus *Pomatocheles* described by me (*P. Z. S.* 1879, p. 49, pl. iii. fig. 2).

#### HERBSTIA OVATA.

*Micropisa ovata*, Stimpson, *Pr. Ac. Nat. Sci. Phil.* p. 217 (1857); A. M.-Edwards, *N. A. Mus. H. N.* iv. p. 51, pl. xvi. figs. 1, 2 (1868).

Two males and a female of this pretty little species were collected at St. Vincent (Cape-Verde) on a sandy bottom. When received, although they had been for some time in spirit, they were of a bright rose-colour.

#### GLAUCOTHOE ROSTRATA, sp. n. (Plate VII. figs. 1-5).

Carapace as in the Paguridae, with the cervical and other sutures distinctly marked, inflated over the branchial regions, and with a median, triangular, sub-acute rostriform process; posteriorly the carapace is much broader than the first postabdominal segment. The postabdominal segments are smooth; the second to fifth narrowed on the sides, and these segments are each furnished with a pair of simple articulated appendages; the ventral surface of the post-abdomen is closed by a soft and membranaceous skin, as in the Paguridae. The terminal segment is twice as long as broad, suboblong, rounded and fringed with long plumose hairs at its distal end. The eyes are subcylindrical; the antennules are short, geniculated; and the flagellum is fringed with long hairs on its under surface. The basal scale of the antennae is obsolete. The outer maxillipedes are short and subpediform. The anterior legs are equal, and terminate in perfectly formed but rather slender chela, the palms of which are compressed, the fingers acute at their apices, and slightly denticulated on their inner margins; the second and third legs are slender, and reach considerably beyond the first legs, their terminal joints being styliform and nearly straight; the fourth and fifth legs are shaped as in the Paguridae; the penultimate joint of the fourth legs is somewhat dilated and compressed, and armed with a series of acute serrately disposed teeth on its inferior margin; the dactylus is strong, arcuate, and acute. The fifth legs are very slender, and the perfectly-formed didactyle chela with which they are terminated very small; the fingers are unarmed, and fringed on their outer surface with fine hairs. The terminal joint of the second to fifth postabdominal appendages is fringed with long, flexible plumose hairs. The rami of the uropoda are similarly ciliated, and unequal in size, the inner and smaller being regularly oval, the outer suboblong and obliquely truncated at its distal end. Length  $\frac{1}{2}$  inch.

*Systematic List of the Species*<sup>1</sup>.

## DECAPODA.

1. *Eurypodius latreillei*, Guérin. Sandy Point, Puerto Bueno, Trinidad Channel.
- \*2. *Inachoides microrhynchus*, M.-Edw. and Lucas. Coquimbo.
3. *Epialtus dentatus*, M.-Edwards. Trinidad Channel.
- \*4. — *marginatus*, Bell. Talcahuano.
- \*5. *Pugettia*, sp. South Atlantic.
6. *Pisoides edwardsii* (Bell). Puerto Rosario, Trinidad Channel.
7. *Cancer plebejus*, Pœppig. Picton Channel, Talcahuano.
- \*8. — *edwardsii*, Bell. Talcahuano.
9. — —, var. *annulipes*, n. Trinidad Channel.
- \*10. *Paraxanthus hirtipes*, M.-Edw. and Lucas. Talcahuano.
- \*11. *Actea rufo-punctata* (M.-Edw.). Hotspur Bank, S. Atlantic.
12. *Platyonchus bipustulatus*, M.-Edw. Trinidad Channel.
13. *Peltarion spinulosum*, White. Sandy Point, Cockle Cove, Puerto Bueno.
14. *Goneza serrata*, Dana. Elizabeth Island, Trinidad Channel, Puerto Rosario.
15. *Acanthocyclus gayi*, M.-Edw. and Lucas. Isthmus Bay.
- \*16. *Leptograpsus variegatus* (Fabr.). St.-Ambrose Island, S. Pacific.
- \*17. *Chasmognathus granulatus*, Dana. Monte Video, Rat Island.
- \*18. *Sesarma angustipes*, Dana, ? Monte Video, Rat Island.
19. *Halicarcinus planatus* (Fabr.). Elizabeth Island, Cockle Cove, Sandy Point, Trinidad Channel.
- \*20. *Pinnixa transversalis*, M.-Edw. and Lucas. Coquimbo.
- \*21. *Hepatus chilensis*, M.-Edw. Coquimbo.
- \*22. *Platymera gaudichaudii*, M.-Edw. Coquimbo.
23. *Lithodes antarcticus*, Jacq. and Lucas. Puerto Bueno, Alert Bay, Trinidad Channel, Neesham Cove.
24. *Paralomis verrucosus* (Dana). Puerto Bueno, Trinidad Channel.
25. *Eupagurus comptus*, White. Sandy Point, Cockle Cove, Puerto Bueno, Puerto Rosario, Portland Bay.
26. *Munida gregaria* (Fabr.). Sandy Point, Cockle Cove, Trinidad Channel.
- \*27. *Callinassa uncinata*. Talcahuano.
28. *Alpheus scabrodigitus* (Dana). Portland Bay, Borja Bay, Trinidad Channel.
29. —, sp. Portland Bay.
30. *Pandalus paucidens*. Tom Bay, Trinidad Channel.

The unique example, which is, I believe, a male and adult, was dredged at Madeira, in 15-50 fathoms.

This species is distinguished from *Glaucothoe peronii*, M.-Edwards, by the existence of a distinct rostriform process, the less-pyriform eyes, the equal chelipedes, &c. *G. peronii* probably inhabited the Asiatic seas.

## SCYLLARUS ARCTUS.

*Cancer arctus*, Linn. Syst. Nat. p. 1053 (1766).

*Scyllarus arctus*, Fabr. Ent. Syst. Suppl. p. 398 (1798); M.-Edwards, Hist. Nat. Cr. ii. p. 282 (1837); White, List Brit. Cr. Brit. Mus. p. 30 (1850); *ubi synonym*.

*Cancer ursus minor*, Herbst, Nat. Krabben, ii. p. 83, pl. xxx. fig. 2 (1796).

*Arctus ursus*, Dana, Cr. U.S. Expl. Exp. xiii. p. 516 (1852).

A specimen which I believe to be a very young example of this species was dredged in the same locality as the *Glaucothoe rostrata* (i. e. at Madeira, in 15-50 fathoms). The teeth of the median dorsal series are nearly obsolete, and those of the anterior margin of the terminal antennal joint are blunt; otherwise this example resembles the adult *S. arctus*. Length barely  $\frac{1}{2}$  inch.

<sup>1</sup> The species collected by Dr. Coppinger only at localities north of Patagonia are distinguished by an asterisk.

## STOMATOPODA.

31. *Squilla gracilipes*, n. W. coast of Patagonia.  
 \*32. *Pseudosquilla lessonii*, M.-Edw. Coquimbo.

## ANISOPODA.

33. *Areturus coppingeri*, n. Trinidad Channel.  
 34. *Serolis scythei*, Lütken. Trinidad Channel.

## ISOPODA.

35. *Idotea annulata*, Dana. Port Henry.  
 36. *Styloniscus magellanicus*, Dana. Trinidad Channel, Tom Bay, Port Henry, Cockle Cove.  
 37. *Lironeca nova-zealandia*, White (ined.), Miers. Portland Bay.  
 38. *Ega punctulata*, n. Wolsey Sound.  
 \*39. *Corallana acuticauda*, n. Hotspur Bank.  
 40. *Sphaeroma gigas*. Sandy Point, Elizabeth Island, Silly Bay.  
 41. *Dynamene darwini*, Cunningham. Elizabeth Island, Borja Bay.

## CIRRIPEdia.

42. *Balanus laevis*, Bruguière. Sandy Point.

## Descriptions and Notes on Species.

## DECAPODA.

## EURYPODIUS LATREILLEI.

*Eurypodius latreillei*, Guérin, Mém. du Muséum, xvi. p. 35-4, pl. xiv. (1828); Icon. Crust. R. A. ii. pl. xi. fig. 1 (1829-44); M.-Edw. H. N. C. i. p. 284 (1834); Cr. in Cuv. R. A. (ed. 3) pl. xxxiv bis, fig. 1; Nicolet, in Gay's Hist. de Chile, iii. p. 123 (1849); Dana, Cr. in U.S. Expl. Exp. xiii. p. 104, pl. iii. fig. 1 (1852); Cunningham, Trans. Linn. Soc. xxvii. p. 491 (1871).

*Eurypodius tuberculatus*, Eyd. & Souleyet, Voy. Bonite, Zool. Cr. p. 221, pl. i. figs. 7-9 (1841).

*Eurypodius audouinii*, M.-Ed. & Lucas in d'Orbigny, Voy. Amér. mérid. vi. Cr. p. 3, pl. i. figs. 1-6 (1843); Dana, Cr. l. c. p. 104 (1852); Nicolet, in Gay's Hist. Chile, Zool. iii. p. 123 (1849); Cunningham, Trans. Linn. Soc. xxvii. p. 491 (1871).

*Eurypodius septentrionalis*, Dana, Amer. J. Sci. & Arts (ser. 2) xi. p. 270 (1851); U.S. Expl. Exp. Cr. i. p. 101, pl. ii. fig. 6 (1852); Cunningham, Trans. Linn. Soc. Zool. xxvii. p. 491 (1871).

*Eurypodius brevipes*, Dana, Amer. J. Sci. & Arts, xi. p. 270 (1851); Cr. Expl. Exp. xiii. 1, p. 193, pl. ii. fig. 7 (1852); Cunningham, Trans. Linn. Soc. Zool. xxvii. p. 491 (1871).

I have been obliged to include all the specimens in the Museum collection under the single heading of *E. latreillei*, because I find myself unable to distinguish them by the characters usually employed in descriptions, *i. e.* the comparative length of the penultimate and antepenultimate joints of the ambulatory legs, the density of the pubescence, the denticulations of the inner margin of the fingers, and the tuberculation of the carapace. All of these characters appear to be subject to considerable variation. There may possibly be two or

even more distinct species of this genus; but the series in the British-Museum collection does not suffice to decide this question, by far the greater number of specimens having been obtained at or near the southern extremity of the American continent. Bell (Trans. Zool. Soc. ii. p. 40, 1849) refers examples of *Eurypodius* from Brazil to *E. latreillei*; but I have seen no specimens from this locality.

In the great majority of specimens in the British-Museum collection, the spines of the rostrum are robust, of moderate length, and curve slightly downward; the spines on the branchial regions are small or reduced to tubercles; and the penultimate joints of the ambulatory legs are considerably dilated and longer than the antepenultimate joints. In younger individuals the joints of the legs and rostral spines are slenderer. One adult male from Sandy Point, in the series presented to the British Museum by Dr. Cunningham, differs from all others in the collection in the greater development of the anterior legs, in which the palm is turgid and the dactylus armed with a very strong tubercle on its inner margin. In two examples from Chili (one an adult male), which I at first thought might be regarded as a distinct species, the branchial spines are somewhat more developed, and the antepenultimate joints about equal the penultimate joints in length, these latter being also less dilated than in adult examples from the Straits of Magellan and Falkland Islands. A better series of examples from Chili, however, is needed to prove whether or not these characters are permanent. I have seen no examples in which the antepenultimate joints of the legs greatly exceed the penultimate joints in length.

Dr. Cunningham in his Report (*l. c.* p. 491) retains no fewer than four distinct species—*E. latreillei*, *E. audouinii*, *E. septentrionalis*, and *E. brevipes*.

The series collected by Dr. Coppinger includes:—several adult males and females from Puerto Bueno, obtained at a depth of 4 fathoms, on a muddy bottom; a female and several young from Sandy Point, at 7-10 fathoms; and one young individual obtained in Trinidad Channel, at a depth of 30 fathoms.

#### INACHOIDES MICRORHYNCHUS.

*Inachoides microrhynchus*, Eydoux & Souleyet, Voy. Bonite, Zool. Cr. p. 219 (1841); M.-Edw. & Lucas in d'Orbigny's Voy. Amér. mérid. vi. Cr. p. 4, pl. iv. fig. 2 (1843); Gay, Hist. de Chile, Zool. iii. Cr. p. 126 (1849).

*Xiphus margaritifère*, Eyd. & Soul. Voy. Bonite, Zool. Cr. Atlas, pl. i. fig. 1 (1841).

Two males and a female were brought by Dr. Coppinger from Coquimbo.

Both genus and species have been hitherto unrepresented in the collection of the British Museum. The adult male agrees very well with Milne-Edwards and Lucas's figure; but the depressions separating the regions of the carapace are not very strongly marked, as stated in the description of these authors.

**EPIALTUS DENTATUS.**

*Epialtus dentatus*, M.-Edwards, Hist. Nat. Crust. i. p. 345 (1834); Nicolet, in Gay's Hist. de Chile, iii. p. 131 (1849); Cunningham, l. c. p. 491 (1871).

*Inachus mitis*, Pöppig, Arch. f. Naturg. ii. p. 141 (1836); Gay, Hist. de Chile, iii. p. 125 (1849).

A single small female is in the collection, obtained on the beach in Trinidad Channel. Its occurrence at various widely separated localities on the coast of Chili is noted by Dr. Cunningham.

**EPIALTUS MARGINATUS.**

*Epialtus marginatus*, Bell, Proc. Zool. Soc. p. 173 (1835), Trans. Zool. Soc. ii. p. 62, pl. xi. fig. 4, ♀, pl. xiii. ♂ (1841); Smith, Trans. Conn. Ac. ii. p. 33 (1869).

A female and young male are in the collection, from Talcahuano.

**PUGETTIA, sp.**

A single female example is in the collection, which is distinguished from *P. richii* and *P. gracilis*, Dana, its congeners of the American coast, as follows:—The body is somewhat more elongated and convex on the gastric region; the lateral expansions or lobes of the carapace are but little prominent, forming small, subconical, acute teeth; the spines of the rostrum are slender and but little divergent. The example is a small one; and being of the female sex it would not be desirable to constitute it the type of a new species. If distinct, as is probably the case, it may be named *P. australis*.

It was obtained at a depth of 28 fathoms, on a bottom of black sand, in lat. 36° 47' S., long. 55° 17' W., at the mouth of the Rio de la Plata.

**PISOIDES EDWARDSII.**

*Hyas edwardsii*, Bell, Proc. Zool. Soc. p. 171 (1835), Trans. Zool. Soc. ii. p. 49, pl. ix. fig. 5 (1841).

*Pisoides tuberculosus*, M.-Edw. & Lucas, in d'Orbigny's Voy. Amér. mérid. vi. Crust. p. 11, pl. v. fig. 1 (1843); Nicolet, in Gay's Hist. de Chile, iii. p. 134 (1849); A. M.-Edwards, Crust. in Miss. Scientif. Mexique, p. 75, pl. xvi. fig. 5 (1875).

*Pisoides edwardsii*, Dana, Cr. in U.S. Expl. Exp. xiii. i. p. 87, pl. i. fig. 2 (1852).

Two males were collected:—one at Trinidad Channel, at a depth of 30 fathoms, on a sandy bottom; the other at Port Rosario, at 2–30 fathoms, on a bottom of sand and rock.

This is a very interesting addition to the Museum collection, as both genus and species were hitherto unrepresented in it. It is one of the few Magellan species having a considerable range to the northward, having been obtained from Chili (Valparaiso), the Galapagos, and Panama. Its occurrence in the Straits of Magellan is now, I believe, for the first time recorded.

The examples before me differ from the description of Edwards and Lucas, in the third joint of the legs not being armed with any prominent spines, and in this joint in the ambulatory legs being less dilated and compressed; but this may probably be due to the greater age of Dr. Copping's specimens. The carapace is densely pubescent; the chelæ naked, and of a bright rose-colour. Length of largest individual about  $1\frac{1}{8}$  inch.

Two Californian species described with doubt as belonging to this genus by Mr. Lockington, Pr. Cal. Ac. Sci. vii. pp. 66, 67 (1876), under the names of *Pisoides? celatus* and *P.? tumidus*, belong, as I learn from a MS. note of the author, to *Microphrys*—the former being identical with *Microphrys platysoma*, as noted by Streets and Kingsley.

#### CANCER PLEBEJUS.

*Cancer plebejus*, Pöppig, Arch. f. Naturg. p. 134 (1836); A. M.-Edwards, Nouv. Arch. Mus. Hist. Nat. i. p. 188 (1865).

A young male individual was taken in Picton Channel, at a depth of 6 fathoms, on a bottom of sand. Two females were dredged at Talcahuano.

#### CANCER EDWARDSII.

*Cancer edwardsii*, Bell, Trans. Zool. Soc. i. p. 338, pl. xlv. (1835); A. M.-Edw. N. Arch. Mus. H. N. i. p. 123 (1865); Cunningham, l. c. p. 491 (1871).

*Platycarcinus edwardsii*, Gay, Hist. de Chile, iii. p. 144 (1849).

A young male was taken at Talcahuano, in which the coloration is of the normal type.

#### CANCER EDWARDSII, var. ANNULIPES, n.

A young male was found on the beach in Trinidad Channel. In its convex carapace, and in the form of the teeth of the antero-lateral margins and of the anterior legs, this species agrees well with normal specimens of the Chilean *C. edwardsii*. It differs, however, remarkably in the coloration, which is very well preserved in the specimen (a dried one). The prevailing colour is light yellow, varied with blotches of dark purplish brown; and the joints of the legs are regularly annulated with broad bands of the same colour. Length about 2 inches, breadth 3.

#### PARAXANTHUS HIRTIPES.

*Paraxanthus hirtipes*, M.-Edw. & Lucas, in d'Orbigny's Voy. Amér. mérid. vi. Crust. p. 18 (1843); Nicolet, in Gay's Hist. de Chile, iii. p. 141 (1849).

A female is in the collection from Talcahuano.

I may take this opportunity of noting that two young specimens received from Mr. Lockington, and labelled by him "*Xanthodes hemphilliana*," appear to belong to this species. Mr. Lockington has since identified the types of *X. hemphilliana* with *Lophoxanthus*

*bellus* (*Xantho bellus*, Stimpson), to which species also his *X. leucomanus* is to be referred.

#### ACTÆA RUFOPUNCTATA.

*Xantho rufopunctatus*, M.-Edwards, Hist. Nat. Crust. i. p. 389 (1834).

*Actæa rufopunctata*, A. M.-Edwards, N. Arch. Mus. Hist. Nat. i. p. 268, pl. xviii. fig. 1 (1865); Heller, Cr. südl. Europa, p. 70 (1865).

A female of very small size (breadth only 3 lines), but laden with ova, is in the collection, which apparently belongs to this species. *A. rufopunctata*, which was originally described from the Red Sea, has a wide Indo-Pacific distribution. Dr. Coppinger's specimen was dredged at a depth of 35 fathoms, amid coral on the Hotspur Bank, lat. 17° 32' S., long. 35° 45' W. Hence (if the example be correctly determined) it would appear that its range extends into the South Atlantic.

#### PLATYONYCHUS BIPUSTULATUS.

*Platyonychus bipustulatus*, M.-Edwards, Hist. Nat. Crust. i. p. 437, pl. xvii. figs. 7-10 (1834); Gay, Hist. de Chile, iii. p. 148 (1849); A. M.-Edw. Arch. Mus. H. N. x. p. 413 (1861); Miers, Zool. Ereb. & Terror, Crust. p. 2, pl. i. fig. 1 (1874); Cat. New-Zeal. Crust. p. 32 (1876), *ubi synon.*

*Platyonychus purpureus*, Dana, Cr. U.S. Explor. Exped. xiii. p. 291, pl. xviii. fig. 3 (1852); Cunningham, Trans. Linn. Soc. Zool. xxvii. p. 492 (1871).

A female individual was obtained in shallow water in Trinidad Channel. Dr. Cunningham records it from Coquimbo and Luco Bay; and it is widely distributed through the Chilean, Australian, Indian, and Japanese seas.

#### PELTARION SPINULOSUM.

*Atelecyclus spinulosus*, White, Ann. & Mag. Nat. Hist. (ser. 1) xii. p. 345 (1843).

*Peltarion spinulosum*, White, List Crust. Brit. Mus. p. 52 (1847); Dana, U.S. Explor. Exped. xiii. Crust. i. p. 304, pl. xviii. fig. 6 (1852); Cunningham, l. c. p. 494 (1871).

*Peltarion magellanicus*, Jacq. & Lucas, Voy. Pôle Sud, Zool. iii. Crust. p. 83, pl. viii. fig. 1 (1853).

Several specimens of this common inhabitant of the Falkland Islands and Patagonian seas were collected. The localities are:—Sandy Point, 9-10 fathoms, bottom sand, one female; Cockle Cove, on a muddy bottom, one male; Puerto Bueno, 2-7 fathoms, bottom rocky, three females.

#### GOMEZA SERRATA.

*Gomeza serrata*, Dana, U.S. Expl. Exp. xiii. Crust. i. p. 305, pl. xviii. fig. 7 (1852).

A male of this species (which is probably rare, as it was not met



with by Dr. Cunningham) was obtained at Elizabeth Island in 6 fathoms, another in Trinidad Channel in 4 fathoms, and two others in Puerto Rosario in 2-30 fathoms. Dana's specimen was obtained by Lieut. Case on the coast of Patagonia at a depth of 50 fathoms, and was only  $1\frac{1}{2}$  line in length; the length of the largest individual collected by Dr. Coppinger is 5 lines. It was previously unrepresented in the British-Museum collection.

#### ACANTHOCYCLUS GAYI.

*Acanthocyclus gayi*, M.-Edw. & Lucas, in d'Orbigny's Voy. Amér. mérid. vi. Cr. p. 30, pl. xv. fig. 1 (1843); Nicolet in Gay's Hist. Chile, Zool. iii. Cr. p. 176 (1849); Dana, Cr. U.S. Expl. Exp. xiii. p. 295, pl. xviii. fig. 4 (1852); Heller, Reise der Novara, Crust. p. 70 (1865); Cunningham, l. c. p. 494 (1871).

? *Plagusetes elatus*, Heller, Verh. zool.-bot. Gesellsch. Wien, xii. p. 522 (1862).

A single male individual is in the collection, obtained on the beach at Isthmus Bay, in the Straits of Magellan. It has long been known as inhabiting the Chilean seas, and was taken by Dr. Cunningham plentifully at Lota.

#### LEPTOGRAPSUS VARIEGATUS.

*Cancer variegatus*, Fabr. Ent. Syst. ii. p. 450 (1793).

*Grapsus variegatus*, Latr. Hist. Crust. et Ins. vi. p. 71 (1803); M.-Edwards, Hist. Nat. Crust. ii. p. 87 (1837); Nicolet in Gay's Hist. de Chile, iii. p. 167 (1849); Miers, Cat. New-Zeal. Crust. p. 36 (1876).

*Grapsus personatus*, Lam. Hist. Anim. sans Vert. v. p. 249 (1818).

*Grapsus strigilatus*, White, in Gray's Zool. Miscell. p. 78 (1842).

*Grapsus planifrons*, Dana, Proc. Ac. Nat. Sci. Phil. p. 249 (1851); U.S. Expl. Exp. xiii. Cr. i. p. 338, pl. xxi. fig. 3 (1852); Cunningham, l. c. p. 493 (1871).

*Leptograpsus gayi*, M.-Edwards, Ann. Sci. Nat. ser. 3, Zool. xx. p. 172 (1853).

Two females were obtained on the shore at the island of St. Ambrose, in the South Pacific. This locality is of interest, as never having been previously visited by the carcinological collector. This species, however, is known to range from the Australian to the Chilean seas.

#### CHASMOGNATHUS GRANULATUS.

*Chasmagnathus granulatus*, Dana, Pr. Ac. Nat. Sci. Phil. p. 251 (1851); U.S. Expl. Exp. xiii. Cr. i. p. 364, pl. xxiii. fig. 6 (1852); M.-Edw. Ann. Sci. Nat. sér. 3, Zool. xx. p. 200 (1853).

*Helice granulata*, Smith, Trans. Conn. Acad. ii. p. 37 (1869).

Three examples (males), in somewhat mutilated condition, were collected at Rat Island, Monte Video. Dana's specimens were from Rio de Janeiro; from which locality are specimens in the British-Museum collection, from the Smithsonian Institution. Professor Smith (l. c.) gives Rio Grande as a locality for the species.

## SESARMA ANGUSTIPES?

*Sesarma angustipes*, Dana, U.S. Explor. Exped. xiii. Cr. i. p. 358, pl. xxii. fig. 7 (1852)?; Cunningham, Trans. Linn. Soc. Zool. xxvii. p. 493 (1871); Smith, Trans. Conn. Ac. ii. p. 37 (1869); nec Stimpson, Ann. Lyc. Nat. Hist. New York, vii. p. 66 (1858).

To this species I refer, with considerable hesitation, a male example collected at Rat Island, Monte Video, with *Chasmognathus granulatus*. It is certainly not identical with specimens received from the Smithsonian Institution, from Florida and the Tortugas, under the name of *S. angustipes* (probably so named by Dr. Stimpson); but it appears to agree more nearly in the distinctly granulated carapace and hand and mobile finger of the anterior legs with Dana's description than do these specimens. In these latter the hand and fingers are nearly smooth, and the carapace is more convex toward the antero-lateral angles. If the Floridan species be not the true *S. angustipes*, Dana, it may be designated *S. stimpsonii*.

Dana gives merely South America as the habitat of *S. angustipes*. Prof. S. I. Smith has pointed out that there can be little doubt that Dana's specimens were collected at Rio de Janeiro; a specimen from this locality is also referred to this species by Dr. Cunningham, which I have examined and find to be identical with the Monte-Videoan example. They come nearer to *S. cinerea*, Bosc (of which the Museum also possesses specimens from the Smithsonian Institution, from Carolina), being only distinguished by the more convex and distinctly granulated carapace and strongly granulated hands.

## HALICARCINUS PLANATUS.

*Cancer planatus*, Fabr. Ent. Syst. ii. p. 446 (1793).

*Halicarcinus planatus*, White, Ann. & Mag. Nat. Hist. xviii. p. 178, pl. ii. fig. 1 (1846); Cunningham, Trans. Linn. Soc. Zool. xxvii. p. 492 (1871); Miers, Phil. Trans. clxviii. p. 201 (1879), *ubi synon.*

This widely spread inhabitant of the Antarctic region is very common in the Straits of Magellan, where its occurrence at many localities was noted by Dr. Cunningham. Dr. Coppinger's specimens were from Elizabeth Island, 6 fathoms, on a sandy bottom (two females); Sandy Point, 9-10 fathoms (one female); Cockle Cove, 2-32 fathoms, on a muddy bottom (one female); Trinidad Channel, 4 fathoms, on a bottom of fine sand (one male and one young).

## PINNIXA TRANSVERSALIS.

*Pinnotheres transversalis*, M.-Edw. & Lucas, in d'Orbigny's Voy. Amér. mérid. Cr. p. 23, pl. x. fig. 3 (1843); Gay, Hist. de Chile, Zool. iii. Cr. p. 156 (1849); Cunningham, Trans. Linn. Soc. Zool. xxvii. p. 492 (1871)?

*Pinnixa transversalis*, M.-Edw. Ann. Sci. Nat. sér. 3, Zool. p. 220 (1853).

A male of rather small size is in the collection from Coquimbo. This example agrees exactly with the description of M.-Edw. and Lucas in possessing small and tomentose chelipedes, a transverse

raised line on the posterior part of the carapace, and in the greatly dilated semicircular terminal joint of the postabdomen. Larger specimens from Sandy Point, named *P. transversalis* by Dr. Cunningham, differ in the obsolescence of the transverse raised line on the carapace, the considerably dilated chelipedes with denticulate dactyli, and the smaller, more transverse terminal joints of the postabdomen, and seem to be more nearly allied to *P. faba*.

The differences may be due to age, or may be of specific value.

#### HEPATUS CHILENSIS.

*Hepatus chilensis*, M.-Edw. Hist. Nat. Crust. ii. p. 117 (1837).

*Hepatus chilensis*, M.-Edw. & Lucas, in d'Orbigny's Voy. Amér. mérid. vi. part i. Cr. p. 28, pl. xiv. fig. 1 (1843); Nicolet, in Gay's Hist. de Chile, Zool. iii. Cr. p. 174 (1849); Dana, U.S. Expl. Exp. xiii. Cr. i. p. 395, pl. xxv. fig. 3 (1852); Kinahan, Journ. Roy. Dublin Soc. i. p. 345 (1858); Heller, Reise der Novara, Cr. p. 70 (1865); Cunningham, l. c. p. 493 (1871); Miers, Proc. Zool. Soc. p. 656 (1877).

Four males were collected at Coquimbo, at a depth of 4 fathoms, on a sandy bottom. The coloration in all is of the normal type.

#### PLATYMERGA GAUDICHAUDII.

*Platymerga gaudichaudii*, M.-Edw. Hist. Nat. Cr. ii. p. 108 (1837);

M.-Edw. & Lucas, in d'Orbigny's Voy. Amér. mérid. Cr. p. 28, pl. xiii. fig. 1 (1843); Gay, Hist. de Chile, Zool. iii. Cr. p. 172 (1849).

A young male was obtained at Coquimbo, length about 5 lines, breadth (exclusive of lateral spines) about 7 lines. This example differs from an adult male from Chili in the British-Museum collection, in the form of the carapace, which in the young male is much narrower in proportion to its length.

#### LITHODES ANTARCTICUS.

*Lithodes antarcticus*, Jacq. & Lucas, Voy. Pôle Sud, Zool. iii. Cr. p. 90, pl. vii. fig. 1 and pl. viii. fig. 9 (1855); Nicolet, in Gay's Hist. Chile, Zool. iii. Cr. p. 182 (1849)<sup>1</sup>; Dana, Cr. U.S. Expl. Exp. xiii. p. 427, pl. xxvi. fig. 15 (1852); Cunningham, l. c. p. 494 (1871).

Two male examples of rather small size were collected—one from Puerto Bueno in 4 fathoms, and the other from Neesham Cove, Trinidad Channel, in shallow water; another and larger individual is from Alert Bay, on the west coast of Patagonia. Dana records this species from Fuegia, and Gay from Chiloe.

#### PARALOMIS VERRUCOSUS.

*Lithodes verrucosus*, Dana, U.S. Expl. Exp. xiii. Cr. i. p. 428, pl. xvi. fig. 16 (1852); Cunningham, l. c. p. 494 (1871).

*Paralomis verrucosus*, Stimpson, Proc. Ac. Nat. Sci. Phil. p. 231 (1858).

Four male individuals were collected at Puerto Bueno, at a depth

<sup>1</sup> The figure in the Atlas of the 'Voyage au Pôle Sud' was published before the description in Gay's work.

of 4 fathoms, amid rock and kelp, and another at Trinidad Channel. Dana records it from Fuegia; and Dr. Cunningham met with it in great numbers at the Tyssen Islands, Falkland Sound, and in the eastern portion of the Straits of Magellan.

The rostrum terminates in a spine, behind and above which are two smaller spines.

In the *Paratomis granulosus* (*Lithodes granulosus*, Jacq. & Lucas) the rostrum is described as very short, obliquely truncated, distinctly curved downwards towards the base, and surmounted by three spiniform tuberculated teeth; in other respects it closely resembles this species, and, like it, inhabits the Straits of Magellan. Has the rostrum been broken off in the specimen described?

In a very young example from the Antarctic seas, in the British-Museum collection, the granulated and wart-like tubercles of the carapace are closely crowded together, so that none of the smooth under surface is visible, and the spines of the legs are much smaller.

#### EUPAGURUS COMPTUS.

*Pagurus comptus*, White, Proc. Zool. Soc. p. 122 (1847); id. Ann. & Mag. Nat. Hist. (ser. 2) i. p. 224 (1848).

*Eupagurus comptus*, Stimpson, Proc. Ac. Nat. Sci. Phil. p. 237 (1858); Miers, Zool. Erebus & Terr., Cr. p. 3, pl. ii. figs. 5, 5a (1874).

*Pagurus forceps*, Cunningham, l. c. p. 495 (1871), nec Edwards.

To this species I refer nine specimens collected by Dr. Coppinger at Sandy Point in 7-10 fathoms, inhabiting shells of the genera *Euthria*, *Natica*, and *Trophon*; also a specimen collected at Cockle Cove, on a muddy bottom, depth 2-32 fathoms; one from Puerto Bueno, at 4 fathoms; four obtained at Portland Bay on a hard sandy bottom, depth 10 fathoms; and a young specimen obtained at Port Rosario in 2-30 fathoms. These are the same species as the individuals collected by Dr. Cunningham at Possession Bay and Port Otway, in the Museum collection, and referred by him to *P. forceps*. *E. forceps*, however, appears to be distinguished by the much shorter, broader, larger hand, and the much shorter and less slender fingers of the left anterior leg. White's typical specimen of *E. comptus* was collected at the Falkland Islands.

Two varieties occur of this species. The typical form is readily distinguished by the form of the hand of the right anterior leg, which (with the fingers closed) is of an ovate shape, narrower distally, finely granulated externally, with a prominent granulated ridge on the upper surface of the palm, and the ridges on its outer surface very indistinct; the arm has a granulo-spinulous line on its upper margin; the smaller hand is somewhat trigonous, with the fingers scarcely longer than the palm; and the second and third legs are annulated with red. To it belong, besides White's typical specimen, the one collected by Dr. Coppinger at Puerto Bueno and one of those obtained by Dr. Cunningham at Possession Bay. In the other, and apparently commoner variety, the larger hand is shorter, of a much more oblong-ovate form, the granulous ridges on the outer surface of the palm

are more distinct, and its lower margin is distinctly granulated. This variety may be designated *Eupagurus comptus*, var. *latimanus*.

#### MUNIDA GREGARIA.

*Galathea gregaria*, Fabr. Ent. Syst. ii. p. 473 (1793).

*Grimothea gregaria*, Leach, Dict. Sci. Nat. xviii. p. 50 (1820); M.-Edw. Hist. Nat. Crust. ii. p. 277 (1837); id. in Cuv. R. A. (ed. 3), Atlas, pl. xlvii. fig. 2; Dana, Cr. U.S. Expl. Exp. p. 483, pl. xxxi. fig. 1 (1852); Cunningham, Trans. Linn. Soc. Zool. xxvii. p. 496 (1871).

*Munida subrugosa*, Dana, l. c. p. 479, pl. xxx. fig. 7 (1852); Miers, Zool. Erebus and Terror, Cr. p. 3, pl. iii. fig. 2 (1874); id. Cat. New-Zeal. Crust. p. 68 (1876).

*Galathea subrugosa*, Cunningham, l. c. p. 495 (1871).

In the 'Catalogue of New-Zealand Crustacea,' I adduced certain reasons for believing that the *Munida subrugosa* of White and of Dr. Cunningham is nothing but the mature state of the long-known and exceedingly common Patagonian species *Grimothea gregaria*, Fabricius. There is considerable variation between younger and older individuals in the length of the external maxillipedes, spines of the antero-lateral angles of the carapace, and of the anterior legs. In the typical specimens of *M. subrugosa* from the Auckland Islands the rostrum is relatively longer and the antero-lateral marginal spines somewhat less numerous (7-8) than in the Patagonian form; but the Museum has received adult specimens from New Zealand which agree in all respects with examples from the Magellan Straits. I was formerly inclined to think that the specimens referred by Dana to *M. subrugosa* belonged to a distinct species; but the larger series of specimens now before me would seem to show that I was wrong in that conclusion.

The examples collected by Dr. Coppinger are from Sandy Point (seven females and one male), depth 7-10 fathoms, bottom sand and dead acorn-shells; Cockle Cove, 2-32 fathoms, bottom mud (male, female, and young); Trinidad Channel, 4 fathoms (four males), bottom sandy (in this locality it was seen in great shoals).

The males are generally of smaller size than the females.

#### CALLIANASSA UNCINATA.

*Callianassa uncinata*, M.-Edwards, Hist. Nat. Crust. ii. p. 310, pl. xxv. bis, fig. 1 (1837); Gay, Hist. de Chile, iii. p. 208 (1849); A. M.-Edw. Ann. Sci. Nat. (ser. 4) xiv. p. 301, pl. xvi. fig. 1 (1860); id. N. Archiv. Mus. Hist. Nat. vi. p. 83 (1870); Cunningham, l. c. p. 494 (1871).

A single specimen, obtained at Talcahuano.

#### ALPHEUS (BETÆUS) SCABRODIGITUS.

*Betæus scabrodigitus*, Dana, Cr. U.S. Explor. Exped. xiii. p. 560, pl. xxv. fig. 12 (1852); Cunningham, l. c. p. 496 (1871).

A male which I refer to this species was collected at Portland Bay at a depth of 10 fathoms; another male and a female, plentifully

laden with ova in an advanced stage, in Trinidad Channel; and an adult male and female at Borja Bay, in 14 fathoms.

In these specimens the larger hand is somewhat slenderer and the fingers less incurved than in Dana's figure; and it is worthy of note that the hand is nearly as much developed and the tubercles of the fingers are as large in the female as in the examples I believe to be males.

The specimens referred to *A. scabrodigitus* by Dr. Cunningham differ even more markedly from Dana's figure in the much longer, slenderer hand and the entire absence of tubercles on the inner margins of the fingers, and, it is very possible, may belong to a distinct species; they are, moreover, of much larger size.

*ALPHEUS*, sp.

A specimen of an *Alpheus* was obtained at Portland Bay, at a depth of 10 fathoms, on a bottom of hard sand, which I will not regard as the type of a distinct species, on account of its small size.

It appears to belong to the same section of the genus and to be nearly allied to *A. euchirus*, Dana. Like it, the orbits are spinuliferous, and the upper and lower margins of the larger hand are notched; the smaller hand is also notched on its upper and lower margins, and the dactylus is flattened, ovate, and clothed with long hairs; there is a spine at the distal end of the third (but not the second) joint of the third and fourth pairs of legs.

*PANDALUS PAUCIDENS*, sp. n. (Plate VII. figs. 6, 7.)

Carapace with a prominent antennal and a very small pterygostomial spine. Rostrum slender, slightly longer than the antennal scale, about  $\frac{1}{2}$ -toothed; four of the dorsal teeth are on the carapace in a median series; the distal end of the rostrum is directed upward, and is without teeth on its upper margin. Antennules considerably longer than the rostrum. The postabdomen is strongly geniculated beyond the third segment, which is unarmed on its dorsal surface. The terminal segment in one specimen is broader, and its apex is imperfect; in the other it is very narrow and elongated, reaching nearly to the end of the slender and narrow uropoda, and is tipped with four cilia at its extremity. The outer maxillipedes (in the larger individual) are robust, and reach (when thrown forward) slightly beyond the antennal scale; their terminal joints are slightly hairy. The styliform terminal joints of the first legs are very slender and acute. The rami of the uropoda are margined with long ciliae, and are rounded at their distal ends; the outer ramus is rather the broader, with the sides parallel, the inner has the sides slightly convergent to the apex. Length of larger specimen to end of rostrum rather more than  $1\frac{1}{2}$  inch.

Two individuals, apparently males, were collected:—one at Tom Bay, on a bottom of rock, kelp, and mud; the other in Trinidad Channel, in 30 fathoms, on a sandy bottom.

This species is principally distinguished by the small number of teeth arming the margins of the rostrum. In the *P. pubescentulus*,

Dana, from the Straits of Da Fuca, Oregon, the rostrum is  $\frac{17}{7}$ -toothed, and in the *P. danae* of Stimpson from Puget Sound, California,  $\frac{12}{6}$  3-toothed; in *Pandalus franciscorum*, Kingsley, also a Californian species,  $\frac{10-11}{7-9}$  2-3-toothed, and in *P. gurneyi*, Stimpson,  $\frac{8-9}{9}$ -toothed. In most of the species of the genus the teeth are much more numerous. In one species, however, the *P. leptorhynchus* of Stimpson (the only one, so far as I am aware, besides *P. paucidens*, described from the Southern hemisphere) the rostrum is only  $\frac{1}{2}$ -toothed; its habitat is Port Jackson, in Australia.

#### STOMATOPODA.

##### SQUILLA GRACILIPES, sp. n. (Plate VII. fig. 8.)

I designate by the above name a specimen (young male) from the west coast of Patagonia, which is allied in nearly all its characters to *Squilla armata*, but is distinguished by the more numerous spines of the dactyli of the raptorial limbs (which are ten in number), the obsolescence of the median and submedian and faint definition of the lateral carinæ of the first to sixth postabdominal segments, and the form of the terminal segment, which is as long as broad, smooth on its upper surface, with the median carina less distinctly marked, and with about 26 denticles between the submedian marginal spines and about 18 on each side between these and the first lateral spines. The outer spine of the distal prolongation of the base of the uropoda is relatively much shorter than in *S. armata*. Length  $3\frac{1}{2}$  inches.

##### PSEUDOSQUILLA LESSONII.

*Squilla cerisii*, Guérin, Voy. Coquille, Crust. p. 40, pl. iv. fig. 1 (1830), *S. lessonii* on plate.

*Squilla spinifrons*, Owen, Proc. Zool. Soc. p. 6 (1832).

*Squilla lessonii*, M.-Edwards, Hist. Nat. Cr. ii. p. 527 (1837); White, List Crust. Brit. Mus. p. 84 (1847).

*Squilla monoceros*, M.-Edwards, Hist. Nat. Crust. ii. p. 526 (1837); Gay, Hist. Chile, Zool. iii. Cr. p. 224 (1849).

*Pseudosquilla lessonii*, Dana, Cr. U.S. Expl. Exp. xiii. i. p. 622 (1852); Miers, Ann. & Mag. Nat. Hist. (ser. 5) v. p. 113 (1880).

*Pseudosquilla marmorata*, Lockington, Pr. Cal. Ac. Sci. p. 33 (1877).

A male and female were collected at Coquimbo.

#### ANISOPODA.

##### ARCTURUS COPPINGERI, sp. n. (Plate VII. fig. 9.)

The body is robust, and broadest at the fourth thoracic segment, and is everywhere covered with close-set granules. Head with the anterior margin deeply excavated. The median portion of each of the thoracic segments is elevated, and forms a transverse ridge extending to the lateral margins of the segment; the ridge so formed is narrowest in the middle, but at the lateral margins covers nearly the

whole surface of the segments. The first and the second postabdominal segments are similarly ridged, but firmly united together; the terminal portion (formed of the coalescent remaining segments) is ovoid, more closely and distinctly granulated than the rest of the body, and terminates in two acute spines. The eyes are placed in the lateral margins of the head. Antennules very small. Antennæ a little longer than the body, with the last two joints of the peduncle about equal; flagellum short, 9-jointed, the first joint as long as the three following. The inferior margins of the last three joints of the first to fourth pairs of legs (which increase successively in length) are clothed with long close hairs. The dactyli of the fifth to seventh legs are strong and slightly arcuated. The operculiform posterior pair of postabdominal appendages are granulated on their outer surface. Length 1 inch (exclusive of antennæ).

A single female was obtained, at a depth of 30 fathoms, in Trinidad Channel, on a sandy bottom.

This beautiful species is at once distinguished by the strongly granulated body and the spines of the last postabdominal segment.

On account of the extreme brevity of the fourth segment of the body, it would be placed in the subgenus *Leachia* were the character valid even as a specific distinction; but the Rev. T. R. R. Stebbing (Ann. & Mag. Nat. Hist. ser. 4, xv. p. 187, 1875) has pointed out that in the case of *Arcturus lineatus* this segment, which is elongated in the adult, is shorter in the young individual; there can be no doubt therefore that *Arcturus* and *Leachia* must be united.

#### SEROLIS SCYTHEI.

*Serolis scythei*, Lütken, Naturhist. Vidensk. Meddelelser, p. 98, pl. i. A. figs. 12, 13 (1858); Grube, Arch. f. Naturg. xli. pp. 209, 220, pl. v. fig. 1. pl. vi. fig. 1 (1875).

Two males were obtained in Trinidad Channel, Straits of Magellan, at 30 fathoms; and an adult female with ova, together with eight smaller individuals, in 4 fathoms, at the same locality.

It is very nearly allied to *S. paradoxa*, Fabr. (*S. fabricii*, Leach), which I have regarded as identical with *S. orbignyana*, M.-Edwards, and which is very common at the Magellan Straits and Falklands—but appears to be constantly distinguished by the much greater length of the coxæ, which in the second postabdominal segment reach nearly to the end of the terminal segment.

#### ISOPODA.

##### IDOTEA ANNULATA?

?*Idotea annulata*, Dana, Crust. U.S. Explor. Exped. xiv. p. 701, pl. xlv. fig. 3 (1853); Cunningham, l. c. p. 499 (1871).

To this species I refer, with some hesitation, four specimens collected at Port Henry. They are of a uniform chestnut-brown colour; the anterior margin of the head is straight or very slightly excavated; the eyes are rather prominent, and situated on the sides



of the head; the flagellum of the antennæ is 7-jointed, the last two joints being little smaller than the preceding, and the terminal segment regularly rounded at its distal end. Dana's specimens were obtained in the Antarctic seas south of Australia.

*Idotea argentea*, Dana, which is apparently distinguished by its colour and the form of the last two joints of the antennæ, is nevertheless very nearly allied to this species.

#### STYLONISCUS MAGELLANICUS.

*Styloniscus magellanicus*, Dana, U.S. Expl. Exp. xiv. Cr. ii. p. 736, pl. xlviii. fig. 7 (1852).

One example of this curious little land Isopod was obtained on shore at Trinidad Channel, one at Port Henry, one from Cockle Cove, and one from the midden-heap of a Fuegian hut in Tom Bay.

#### LIRONECA NOVÆ-ZEALANDIÆ.

*Lironeca novæ-zealandiæ*, White, List Cr. Brit. Mus. p. 106 (1847) descript. nulla; Miers, Ann. & Mag. Nat. Hist. (ser. 4) xvii. p. 227 (1876); id. Cat. New-Zeal. Crust. p. 106, pl. iii. fig. 2 (1876).

A female specimen was found attached to the mouth of a fish in Portland Bay, Straits of Magellan. Hence it is probable that this species, like so many of the New-Zealand fauna, ranges throughout the Antarctic region.

*L. novæ-zealandiæ* is nearly allied to *L. lata*, Dana, from the Sandwich Islands, but is distinguished by its less prominent head, which is more deeply encased in the first segment of the body, and by the shorter rami of the uropoda, which are nearly equal in size to one another, and more acute than in *L. lata*.

#### ÆGA PUNCTULATA, sp. n. (Plate VII. figs. 10-12.)

Body convex, closely punctulated; posterior margins of the segments of the thorax and of the postabdomen clothed with scattered hairs. Head transverse; the coxal joints or so-called epimera of the second to sixth thoracic legs with the postero-lateral angles acute, but not prolonged backward, and with the margins slightly hairy. Postabdominal segments (the terminal excepted) very short; terminal segment somewhat hairy, smooth and unarmed, narrowing posteriorly, and rounded at its distal extremity. Eyes (when viewed from above) oblong, and extending along the lateral margins of the head, but not along the anterior margin. Antennules short, reaching to the postero-lateral angles of the head, with the first and second joints considerably dilated. Antennæ short, scarcely reaching to the postero-lateral angles of the first thoracic segment; flagellum 18-20-jointed. Penultimate joint of the first three pairs of thoracic limbs without any process; dactyli strongly curved and acute. Rami of the uropoda unequal; the inner largest at its distal end and truncated, the outer narrow-ovate and rounded. Length about 1 inch 2 lines.

A single specimen was found attached to the fins of a mullet-like fish in Wolsey Sound, in the Straits of Magellan.

This species externally somewhat resembles *Pterelas magnificus*, Dana, but is destitute of the hatchet-like process on the penultimate joint of the first three pairs of legs.

*Ega belliceps*, Stimpson, a Californian species, is distinguished by its more pointed head, and by having only five distinguishable postabdominal segments; it is somewhat insufficiently characterized. *Ega novæ-zealandiæ*, Dana, is very briefly characterized, but is distinguished by the much longer antennæ, which in *Ega punctulata* are not longer than the breadth of the head. The two American species described by Lockington as *Ega harfordi* and *Ega alaskensis* do not, I believe, belong to this genus; the former is probably a species of *Cirolana*.

CORALLANA ACUTICAUDA, sp. n. (Plate VII. fig. 13.)

Body convex, segments punctulated; the last two thoracic segments and the postabdomen hairy. Head transverse; produced anteriorly into a small median rostriform lobe that projects between the bases of the antennules. Segments of the body subequal and rounded, and not produced at the postero-lateral angles; first segment with its antero-lateral angles rounded and somewhat produced anteriorly beneath the lateral margins of the head. Five segments of the postabdomen are exposed (but scarcely distinguishable, on account of the pubescence with which they are covered); the third segment is produced on each side into a truncated and emarginate postero-lateral lobe; the terminal segment is rather small, triangular, covered above with short, dense, close pubescence, but with a smooth, naked, longitudinal median line. Eyes large, black, distinctly faceted, and situate on the sides of the head. Antennules contiguous at base, their basal joints considerably enlarged posteriorly (but not anteriorly produced beyond the plane of the head), inserted into semicircular cavities in the anterior margin of the head; the following joint slender; flagellum short, not reaching to the posterior margin of the head. Antennæ not in contact at their bases (which are concealed beneath the enlarged basal joints of the antennules), with the first three joints short, the fourth and fifth subequal, longer and slender; flagellum reaching to the posterior margin of the third segment of the body. The coxæ of the second and third legs are small and rounded posteriorly, those of the following legs larger, with the postero-lateral angles acute. The rami of the uropoda spring from a broad base (which is produced at its distal and internal angle into a strong acute lobe); the outer ramus is slender and acute, the inner broad but narrowing to an acute apex; both are ciliated on the margins. Length 7 lines.

The single example (a female) was dredged amid coral in 35 fathoms, on the Hotspur Bank (S. Atlantic) in lat. 17° 32' S., long. 35° 45' W.

This species is distinguished from the various oriental forms enumerated by Schiöde and Meinert, Nat. Tidskr. 3 R. pp. 286, 299

(1879), by the form of the terminal segment, which is acute at its distal end, and the greatly dilated basal joints of the antennules; the outer ramus of the uropoda is not larger than the inner; the frontal interantennular process is obsolete.

#### SPHÆROMA GIGAS.

*Sphæroma gigas*, Leach, Dict. Sci. Nat. xii. p. 346 (1818); M.-Edwards, Hist. Nat. Cr. iii. p. 205 (1840); Miers, Cat. New-Zeal. Crust. p. 110 (1876).

Several specimens, all of small size, of this species, which is very common in the Straits of Magellan and at the Falkland Islands, and also occurs at the Auckland Islands and New Zealand, were collected by Dr. Coppinger at Elizabeth Island (6 fms.) Sandy Point (9-10 fms.) on a sandy bottom, and an adult male at Silly Bay.

#### DYNAMENE DARWINII.

*Cymodocea darwinii*, Cunningham, l. c. p. 499, pl. lix. fig. 1 (1871).

Two examples were obtained by Dr. Coppinger at Elizabeth Island (6 fathoms), on a sandy bottom. It appears to be rare, as Dr. Cunningham met with it only on the north coast of Eastern Fuegia and in very small numbers. An adult example collected by Dr. Cunningham, and preserved in the Museum collection, is a male. The larger of the two obtained by Dr. Coppinger at Elizabeth Island is apparently a female, and is of a bright rose-colour. In a small example from Borja Bay (14 fathoms) the tubercle on the dorsal surface of the terminal segment is less developed and the lateral lobes of the fifth thoracic segment scarcely thickened.

### CIRRIPE DIA.

#### BALANUS LÆVIS.

*Balanus lævis*, Bruguière, Encycl. Méth. pl. clxiv. fig. 1 (1789); Darwin, Monog. Cirripedia, Balanidæ, p. 227, pl. iv. fig. 2 (1854), *ubi synon.*

Several clusters of this species, which is very common and abundant in the Magellan Straits, were collected at Sandy Point, at a depth of 7 fathoms, adhering to shells &c. All are of the typical variety. Its range, according to Darwin, extends northward to Chili, Peru, and California<sup>1</sup>.

<sup>1</sup> Besides the species enumerated above, there are in the collection four small specimens of a species of Amphipoda, allied in many of its characters to *Orcho-mene*, obtained at Elizabeth Island in 6 fathoms, and four specimens of a *Caligus* (not the *C. chæmichthys*, Cunningham) taken from a sea-water fish at Puerto Bueno, in rather bad condition, which I do not venture to describe; also, among the surface-dredgings made at various localities in the North and South Atlantic, larval stages of several species of Decapoda and Stomatopoda and a few species of oceanic Copepoda.

## VII. COLEOPTERA.

By CHAS. O. WATERHOUSE.

## CARABIDÆ.

## 1. CARABUS SUTURALIS, Fabr. Syst. El. i. p. 238.

Four specimens from Neesham Cove, Cockle Cove, Elizabeth Island, and Swallow Bay.

## 2. BRACHYCELIA CONCOLOR, sp. n.

*Cyaneo-nigra, subtus nigra, lævis, nitida; antennis pedibusque piceo-nigris; elytris striatis, striis fere lævibus.* Long.  $8\frac{3}{4}$  mill., lat. 4 mill.

Very close to *B. virescens*, G. R. Waterh., but smaller, darker in colour, and with the antennæ and legs nearly black. Thorax nearly of the same form, transverse, gently arcuate at the sides, but with the posterior angles very slightly turned outwards and slightly acute. The elytra are a little more ovate; *i. e.* the broadest part is rather further from the apex than in *B. virescens*; each elytron has nine striæ, the five dorsal ones moderately strongly impressed and extending nearly to the apex, with no proper punctuation, the interstices slightly convex, especially the fifth; the sixth and seventh striæ are less distinct, and the eighth is only visible posteriorly; the ninth is very distinct and has a series of distinct punctures. The prosternum has a well-marked lanceolate impression between the coxæ, very similar to that in *B. virescens*. The median impressed line on the thorax is shorter than in the specimens of *B. virescens*, rather broader in front, and terminating rather abruptly some way from the anterior margin. The anterior and intermediate tarsi are dilated in the same way as in *B. virescens*.

A single male example taken at Puerto Bueno.

## 3. CASCELLIUS GRAVESII, Curtis, Trans. Linn. Soc. xviii. p. 183, pl. 15. f. B.

*Cascellius nitidus*, G. R. Waterh. Ann. & Mag. N. Hist. vi. 1841, p. 255.

A careful examination of the type specimens of *Cascellius gravesii*, Curtis, and *C. nitidus*, Waterh., has convinced me that they are varieties of the same species. The striæ of the elytra vary very much, being sometimes almost effaced, and sometimes broken up into well-marked elongate impressions. It was this last form which my father considered the true *C. gravesii*, and from which he separated *C. nitidus* as distinct. The type specimen of *C. gravesii*, however, has the striæ lightly impressed. The series of specimens in the British Museum show the intermediate forms.

Dr. Coppinger took a single specimen at Puerto Bueno<sup>1</sup>.

<sup>1</sup> It may be well to note here that *Cascellius kingii*, Curtis, *l. c.* p. 183, pl. xv. f. A (omitted from Gemminger and v. Harold's Catalogue of Coleoptera), is the same as *Feronia (Creobius) eydouzii*, Guérin, Mag. Zool. 1838, p. 4, t. 225. f. 2. Hope's paper was read on May 1st, 1838.

4. ANTARCTIA GLAUCA, Blanch. Voy. Pôle Sud, iv. p. 39, t. 3. f. 4.

Three specimens which, from description, appear to be referable to this species. They were taken at Sandy Point on January 8th, 1879.

#### DYTISCIDÆ.

5. RHANTUS DARWINII, Babington, Trans. Ent. Soc. iii. 1841, p. 8.

A single female example which I refer with some doubt to this species. It is a trifle more parallel than the type specimen; and the thorax is rather more dull. It was taken at Isthmus Bay.

6. RHANTUS MIXTUS, sp. n.

*Ater; clypeo capiteque antice piceo-flavis; thorace piceo-flavo, margine antico punctato, basi medio nigra; elytris politis, piceo-nigris, crebre seriatim piceo-flavo guttatis; antennis, palpis, pedibus prosternoque piceis.* Long.  $5\frac{1}{3}$  lin.

♂. Very close to *R. varius*, Fabr. (Ent. Syst. i. p. 195), but larger, darker in colour than that species usually is, and a little less regularly elliptical. Head finely coriaceous, with an impressed line within each eye. Thorax shining, a little wrinkled at the sides, with an imperfect impressed median line; the middle portion of the anterior margin is distinctly punctured, and this part is also blackish; the base is narrowly margined with black, the black is more suffused in the middle; the posterior angles are a trifle greater than a right angle. Elytra very shining, nearly black, with closely placed lines of small yellowish spots as in *R. varius*, but not so conspicuous; the margins are yellow; the extreme apex (which is obliquely truncate) is margined with black; there is a line of rather close distinct punctures not far from the suture; and there is a second very irregular line of similar punctures extending from within the shoulder to near the apex. The whole of the underside is black, except the front part of the prosternum and the sternal process. The apical segment of the abdomen is densely longitudinally strigose, the striæ reach the base of the segment in the middle but not at the sides. The legs are pitchy, the posterior tarsi being darker; the intermediate femora and tibiæ are closely and rather roughly punctured, more closely and more distinctly than in *R. varius*.

Four male examples, marked "Tom Bay, April 22, 1879."

#### LUCANIDÆ.

7. SCLEROSTOMUS FEMORALIS, Guérin, Rev. Zool. 1839, p. 303.

A single male example taken at Sandy Point.

#### MELOLONTHIDÆ.

8. SERICOIDES GLACIALIS, Fabr. Syst. Ent. p. 35.

*Sericoides reichæi*, Guérin, Rev. Zool. 1839, p. 301.

An imperfect specimen found at Skyring Water. It agrees well

with the Fabrician type of *Melolontha glacialis* now in the British Museum from the Banksian Collection.

9. *LISTRONYX TESTACEUS*, Fabr. Syst. Ent. p. 35.

*Melolontha testacea*, Fabr. l. c., ♀.

*Listronyx nigriceps*, Guérin, Rev. Zool. 1839, p. 302, ♂.

A male example from Sandy Point. It agrees perfectly with Guérin's type specimen of *Listronyx nigriceps* now in the British Museum collection, which is undoubtedly the male of *Melolontha testacea*, Fabr., the type of which is also in the Museum.

10. *CYPHON PATAGONICA*, Curtis, Trans. Linn. Soc. xviii. p. 199.

The single specimen found at Sandy Point by Dr. Coppinger differs from Curtis's type in being uniform in colour, without the fuscous mark on the thorax; it is, however, undoubtedly the same species.

11. *PHOTINUS*, sp.

A single example taken at Tom Bay. I am unable to determine the species; it is broader than *P. obscurus*, Fabr., from Terra del Fuego, which it resembles in colour, and is more like *P. coruscus*, Linn.

TENEBRIONIDÆ.

12. *EMALODERA OBESA*, Guérin, Rev. Zool. 1841, p. 215.

A single specimen, marked "Elizabeth Island, Jan. 1879."

CURCULIONIDÆ.

13. *CYLINDRORRHINUS ANGULATUS*, Guérin, Rev. Zool. 1841, p. 217.

Two specimens from Elizabeth Island, Jan. 6, 1879.

14. *LOPHOTUS NODIPENNIS*, Hope, Trans. Ent. Soc. i. p. 15, pl. i. f. 5.

One specimen only, found at Port Gallant, "on board."

CERAMBYCIDÆ.

15. *CALLISPHYRIS SCHYTHIÆ*, Philippi, Stet. Zeit. 1864, p. 380.

The specimen brought by Dr. Coppinger agrees very well with the description of this species. Another specimen was received almost simultaneously at the Museum from Peru.

VIII. LEPIDOPTERA, ORTHOPTERA AND HEMIPTERA.

By A. G. BUTLER.

A. LEPIDOPTERA.

Of the nine species of Lepidoptera obtained by Dr. Coppinger, two appear to be new to science; and four others may be new, but are too much worn for identification; of the remaining three, one has previously been recorded from the Straits, and two from Chili.

## NYMPHALIDÆ.

## 1. ARGYNNIS CYTHERIS, Drury.

Two pairs taken in Elizabeth Island in January 1879. The males agree well with Drury's figure and with Reed's figure of *A. anna* (Blanchard); one of the females also agrees very fairly with Blanchard's figure of *A. lathonoides*. The allied form, regarded by Reed as the *A. cytheris* of Drury, seems quite distinct, and must retain the name of *A. montana* given to it by Reed upon his plate.

## PAPILIONIDÆ.

## 2. TATOCHILA DEMODICE, Blanchard.

One female captured on the 6th of January in Elizabeth Island.

## LASIOCAMPIDÆ.

## 3. PHRICODIA HUMERALIS, var., Walker.

A male caught on board in the Straits of Magellan, and two females in Elizabeth Island on the 6th of January. These specimens are altogether redder and darker than the typical form.

## EPISEMIDÆ.

## 4. HELIOPHOBUS?, sp.

Puerto Bueno, Straits of Magellan, 20th of January, 1879. The two examples of this species are so much rubbed that, although the Moth appears to agree in structure with *Heliophobus*, it is quite impossible to decide whether or not it is referable to any known species.

## APAMIIDÆ.

## 5. MAMESTRA?, sp.

The single example obtained, although evidently referable to a well-marked species, is unfortunately too much worn for recognition; the antennæ are wanting.

Straits of Magellan, exact locality not noted.

It is not impossible that this may prove to be an *Agrotis* when we see a perfect specimen.

## NOCTUIDÆ.

## 6. OCHROPLEURA MAGELLANICA, sp. n.

Primaries chocolate-brown, with very slight purplish reflections, the basal two thirds of costal border broadly pale sandy brown; the orbicular and reniform spots of the same colour, with slightly darker centres, the orbicular with oblique outer margin and confluent with the costal border along its anterior margin: secondaries pale sericeous greyish brown, with slightly darker diffused outer border and pale sandy-yellow fringe: thorax chocolate-brown; head, antennæ, and shoulders ochraceous; abdomen fuliginous brown, whitish at the base, and with ochraceous lateral fringes and anal tuft. Primaries below pale fuliginous brown; secondaries whitish, with pale fuliginous

costal border and discocellulars and yellowish fringe; body below fuliginous brown. Expanse of wings 1 inch 9 lines.

The above description is made from a specimen obtained by Dr. Cunningham at Sandy Point, Terra del Fuego, the five examples sent home by Dr. Coppinger being all too much worn for description. He notes the following habitats and dates of capture:—

- a. Cockle Cove ..... Feb. 13, 1878.
- b. Latitude Cove, flew on board ..... Jan. 13, 1879.
- c. Puerto Bueno, flew on board ..... Jan. 19, „
- d. Tom Bay, flew on board ..... Jan. 1879.
- e. Wolsey Sound, W. coast of Patagonia,  
flew on board.

#### ORTHOSIIDÆ.

##### 7. *PACHNOBIA COPPINGERI*, sp. n.

Allied to *P. alpina*. Primaries above ashy grey, slightly tinted with pink at the base; two subbasal spots, a broad internally bisinuated, externally ill-defined belt (enclosing the orbicular spot) just before the middle, and two subparallel angulated and zigzag discal lines, dark slaty grey; discoidal spots brown, with whitish borders and blackish margins; a marginal series of <-shaped black markings: secondaries pale sericeous smoky brown, becoming slightly darker towards the outer margin; discocellulars dusky, costal border ash-grey at apex; a marginal dark slaty-grey line formed of confluent depressed-triangular spots; fringe traversed by a whitish basal line: body grey; thorax slightly tinted with pink; abdomen with whitish basal tufts, anal tuft testaceous. Primaries below ash-grey; discal lines indicated, but less distinct than above, and not zigzag: secondaries sericeous greyish white; a discocellular spot and arched discal stripe blackish; a slender blackish marginal line: pectus white; legs ash-grey, tarsi of middle pair brown, tibiæ and tarsi of posterior pair almost wholly laky brown. Expanse of wings 1 inch 6 lines.

Puerto Bueno; flew on board, Jan. 19, 1879.

#### LAURENTIIDÆ.

##### 8. *SCOTOSIA*, sp.

One specimen, very much worn and rubbed, the pattern being entirely lost.

Puerto Bueno, November 5, 1879.

##### 9. *CIDARIA*, sp.

A single shattered example, which appears to be allied to the European *C. fulvata*.

Puerto Bueno.

The ORTHOPTERA are represented by five examples, three of which are immature and referable apparently to a species of *Xiphocera*; the two others belong to the genera *Edipoda* and *Ctypohippus*.



Six HEMIPTERA were obtained, of which one appears to belong to a new species of *Sciocoris*; three are referable to a known species of *Halobates*, one is a new genus of *Membracidae*, and one a small *Iassus*.

A single ANOPLURON was taken, referable to the genus *Trinoton*.

## B. ORTHOPTERA.

### XIPHOCERIDÆ.

#### 1. XIPHOCERA, sp. inc. (immature).

"St. Vincent, near the beach, 24th October, 1878; Puerto Bueno, Straits of Magellan, on shore near freshwater pools."

### ÆDIPODIDÆ.

#### 2. ÆDIPODA AURIFERA.

*Ædipoda aurifera*, Walker, Derm. Salt. iv. p. 735 (1870).

*Epacromia collecta*, Walker, op. cit. v. p. 85 (1871).

St. Vincent, Cape-Verd Islands, from sandy patches, 24th October, 1878.

Walker at first rightly identified this species with the genus *Ædipoda*, but remarked, "this species has some affinity to the genus *Epacromia*;" subsequently he described a smaller example as an *Epacromia*, and observed that "this and the preceding species differ much in structure from each other, and from the typical form of *Epacromia*, and may be considered as the representatives of two new genera."

#### 3. CTYPOHIPPIUS ARENIVOLANS, sp. n.

Apparently nearest to "*Ædipoda ochraceipennis*" of Blanchard, from Chili; also somewhat similar to "*Æ. chloris*." Head and pronotum greenish yellow, with a lateral longitudinal stripe of black, varied with reddish brown; on the head this stripe encloses an ochraceous line; pronotum flat, slightly elevated at the sides, crossed in the middle by a linear transverse impression, and with a central longitudinal carina; abdomen shining, olivaceous, banded indistinctly with testaceous, and mottled at the sides with castaneous; anterior and middle pairs of legs castaneous, posterior legs with the femora greenish testaceous, a series of black spots just above the infero-exterior longitudinal carina towards the base; tibiæ and tarsi rust-red, the spines tipped with black: tegmina with the basal six thirteenths flesh-coloured, with a longitudinal internal green streak and two transverse dark-brown bands, the inner one interrupted by the green streak, the outer one abbreviated; base slightly brown-speckled; remainder of tegmina hyaline white, with ochraceous veins, the cross veinlets black here and there, so as to produce the effect of indistinct greyish spots: wings hyaline white, slightly tinted with yellow towards the base, and crossed from the posterior angle to the centre of the anterior margin by a very slightly interrupted arched blackish

band. Length of body 1 inch 1 line; expanse of tegmina 2 inches 4 lines.

St. Vincent, Cape-Verds, 24th October, 1878; from sandy patches.

I found a second example of this species amongst the heterogeneous crowd of specimens placed by Walker under *Udipoda flava* of Linnæus.

## C. HEMIPTERA.

### SCIOCORIDÆ.

#### 1. SCIOCORIS ODIOSUS, sp. n.

Testaceous, regularly spotted and streaked all over with dull greyish brown; abdomen with regular black marginal spots; pectus longitudinally banded with black; legs ochraceous; antennæ orange; venter with a longitudinal streak of black on each side.

Dull, densely punctured; head obtusely subconical, convex behind, with marginal and dorsal longitudinal carinæ, twice as long before as behind the eyes, which are prominent; thorax octagonal, fully twice as broad as long, deeply excavated in front to receive the head; the humeral angles armed with a short obtuse denticle; scutellum large, half as long again as broad, obtusely triangular; legs smooth and rather slender, tibiæ and tarsi covered rather densely with short bristles; ventral segments with their posterior angles slightly prominent. Length of head 2 millims., of thorax in the middle 2, at humeral angles  $2\frac{1}{2}$ , width 5; length of scutellum 3, of each tegmen 6; entire length of insect 8.

Monte Video (one specimen)

### GERRIDÆ.

#### 2. HALOBATES MICANS.

*Halobates micans*, Eschscholtz, Entomogr. p. 163, pl. 2. fig. 3.

Taken in the towing-net on the surface, 29th Oct. 1878. Lat.  $8^{\circ} 6' N.$ , long.  $25^{\circ} 33' W.$

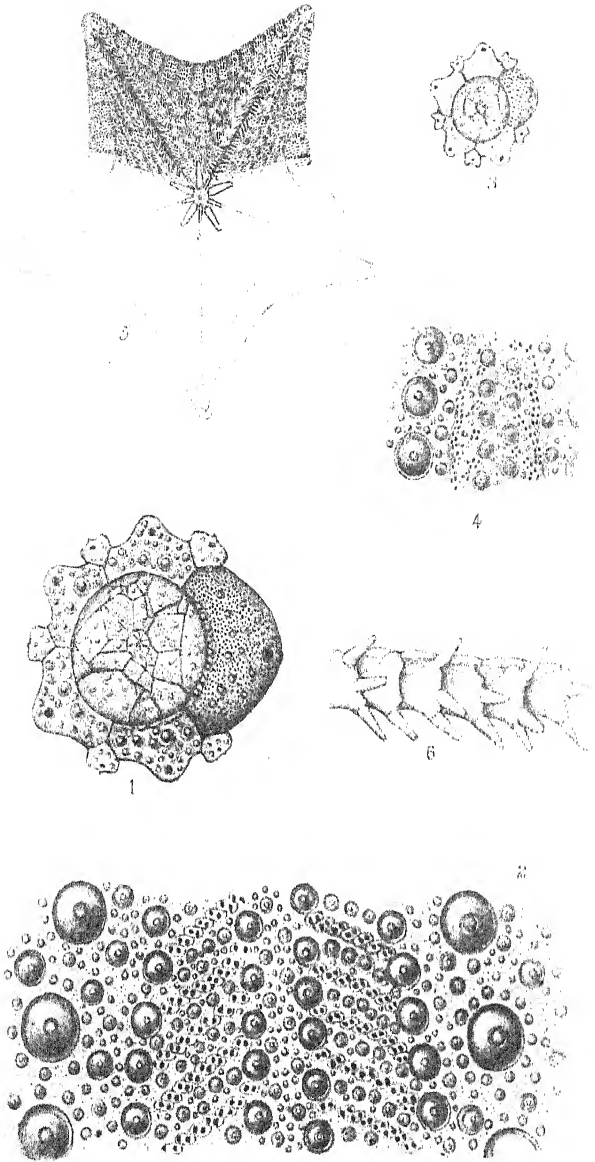
### MEMBRACIDÆ.

#### METHILLE, g. n.

Nearer to *Hille*, Stål, than to any genus with which I am acquainted, but altogether narrower, more depressed, the upper or dorsal margin of the pronotum nearly parallel to the anterior margin of the closed tegmina; the head vertical, almost in a line with the anterior margin of the pronotum, which projects slightly in front of it; the pronotum not covering the mesonotum, its upper surface pentagonal; scutellum uncovered, triangular, very acute behind. Type *M. cuneata*.

This genus in many of its characters seems to agree with *Melioderes* of Spinola, with which, but for the figure, it might perhaps have been identified; but, in spite of the manifest incorrectness of the illustration (which shows no trace of a scutellum, although the



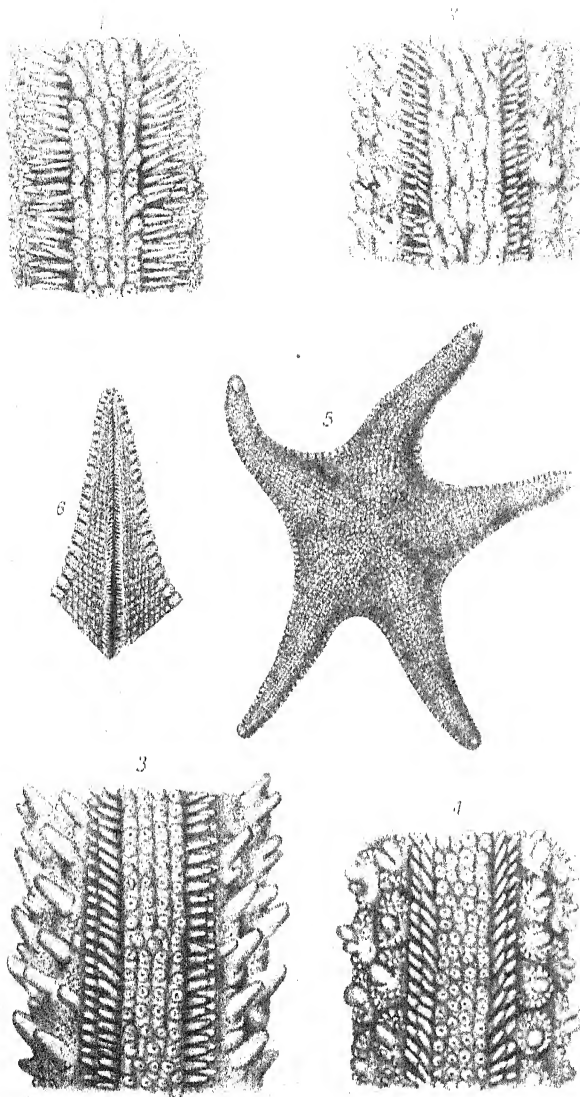


C. Berjeau del. et lith.

Harvard exp.

ECHINODERMATA OF 'ALEUT' SURVEY.





C. Berjeau de la Riv. lith.

Hanhart imp.

ECHINODERMATA OF "ALERT" SURVEY

description says "escudo visible"), I cannot believe it to be identical. The neurulation is the same; but the head is not visible from above, being entirely concealed by the conical and prominent anterior margin of the pronotum.

### 3. METHILLE CUNEATA, sp. n.

Fulvous, upper surface of the body with a central longitudinal cauna; the head orange, head, pronotum, mesonotum, and scutellum finely granulose; tegmina semitransparent, horn-yellow, darkest towards the base and on the veins, the corium and clavus coarsely punctured, wings hyaline white, legs horn-yellow. Length of body  $5\frac{1}{2}$  millims., expanse of tegmina  $11\frac{1}{2}$ .

"Found on leaf of *Campidium chilense*, a leguminous creeping plant, 14th April, 1879. Straits of Magellan."

The genus *Melzoderes* is not quoted by Walker in the Supplement to his 'Catalogue of Homoptera.'

## IASSIDÆ.

### 4. IASSUS LUCIDUS?

*Iassus lucidus*, Butler, Proc Zool. Soc. 1877, p. 91. no. 8.

Caught on board at sea, 27th October, 1878.

I can discover no difference between this example and that from the Galapagos archipelago.

## IX. ECHINODERMATA.

By F. JEFFREY BELL.

(Plates VIII. & IX.)

The collection of Echinodermata which Dr. Coppinger has forwarded presents some points of considerable interest. Of the Echinoidea there is one species which is apparently new to science; the species *Echinus magellanicus* was found on the eastern side of the coast of South America; the Ophiurida are represented by four species, of which two, one of them an Astrophytid, appear to be new to science; while the new species of Asterida seem to make it necessary to direct attention to the fact that, if the number of new species of Echinodermata appears to be disproportionately large as compared with the Mollusca or Crustacea, it must be borne in mind that Dr. Cunningham's account of his collection, made in 1869, terminates with the latter of these groups, and that therefore our knowledge of the Echinoderm fauna of this region is in a less advanced condition. The Holothuroidea are feebly represented in the present collection; and no specimen of the Crinoidea has been as yet forwarded to the Museum.

## ECHINOIDEA.

### ECHINOCIDARIS DUFRESNII, Bl.

A number of these interesting forms were forwarded by Dr. Coppinger. As was natural, I examined them with eagerness in order

to find, if possible, some more exceptions to the rule of the presence of four anal plates<sup>1</sup>; not one, however, was to be found among the fourteen specimens I examined. The localities were:—

- (1) Portland Bay, 10 fathoms; bottom, hard sand.
- (2) Tom Bay, 0–30 fms.; bottom, rock, kelp, and mud.
- (3) Cockle Cove, 2–32 fms.; bottom, mud.
- (4) Port Rosario, 2–30 fms.; bottom, sand and rock.
- (5) Trinidad Channel, 30 fms.; bottom, sand.

The smaller specimens varied considerably in colour; the light green of the test and the purplish flesh-colour of the spines of the ordinary specimens being in one case replaced by a light brown for both test and spines; one or two examples had reddish patches on the bare spaces of the interambulacral areæ; and in two cases the white pedicellariæ, placed on a deep-green test, gave a rarely seen appearance to the specimens; another example had the spines white, with a deep rusty-brown patch in each bare interambulacral space. None of the specimens was of a large size.

*STRONGYLOCENTROTUS BULLATUS*, n. sp. (Plate VIII. figs. 1, 2.)

Test rather thick and slightly pentagonal; superiorly to the ambitus the primary tubercles of the interambulacral areæ, which are set in two rows, are of considerable size; generally eight pairs of pores in each arc, which is set more or less horizontally, and is separated from the one above and below by a not very regular series of small tubercles; the ambulacral area comparatively narrow; the actinostome moderately small and very faintly notched; abactinal system thickly covered with small tubercles; ocular plates all excluded from the anal system; madreporic body large; anal plates large in size and small in number. Test brownish red; the spines not long, and of a dirty or brownish yellow colour.

Straits of Magellan.

The difficult genus *Strongylocentrotus* stands in need of a careful revision; and it is necessary that I should point out some of the reasons which induce me to look upon this species as new, though this is by no means the place to undertake any thing like a general review of the group. It seems, then, to be the only species in which all the ocular plates are excluded from the anal system—presenting a considerable resemblance to *S. franciscanus*, in so far that the primary tubercles of the interambulacral areæ form, in both species, two rows, and are considerably larger than any others on the test; it is distinguished not only by having the tubercles absolutely smaller, but also by the fact that it is above rather than at the ambitus that the largest tubercles are to be found. So, again, a resemblance is to be seen to *S. albus* in the presence of tubercles separating the

<sup>1</sup> P. Z. S. 1879, pt. iii. p. 436. I may here state that during the autumn of 1879 I took the opportunity to examine the few specimens of this genus that are deposited in the Natural-History Museum at Brussels; but I was not able to detect in any of them any indications as to the presence of more than four plates.



arcs of pores; but these tubercles are much smaller and much more irregular in *S. bullatus*, and this new species has also a somewhat larger mouth (actinostome), though it by no means has one so large as has *S. franciscanus*. Turning from *S. albus*, the presence of which on the Chilian coast was signalized by Molina<sup>1</sup>, to *S. gibbosus*, the other member of the genus which has been hitherto recorded from this district, we find in it only four pairs of pores in each arc, while the much smaller test has a proportionally larger actinostome.

The following are the more important measurements of the largest of the three specimens:—

Length.	Height.	Diameter of			Poriferous zone.	Ambul. area.	Interamb. area.
		actino-stome.	abactinal system.	anal system.			
108	49	25	20	11.5	7.5	24	40

It will be seen that the test is not high, that, although the arcs of pores are so nearly horizontal in direction, the ambulacral aræ are not very wide; they are, indeed, only provided with two rows of primary tubercles, which are never very large, and, like those of the interambulacral series, decrease to quite a small size on the greater part of the actinal surface. The number of secondary tubercles (or, rather, of large miliaries) is very much greater than in *S. franciscanus*; and the scrobicular circle around which they form a ring in the interambulacral, though not in the ambulacral aræ, is not so wide as in that species. There is no petaloid enlargement of the poriferous zone around the actinostome; the number of pores in an arc may be here and there reduced to seven. The large number of small tubercles on the plates of the abactinal system is very striking, as is, too, the large size of the anal and madreporic plates. The auricles are well developed, and the space between the two halves elongated and triangular. As in *S. lividus*, the dentary apparatus is not as much as one half the height of the test; but the fenestræ (or spaces between the alveoli) are proportionally much shorter, and the radii are long enough to reach to the margin.

Three specimens were sent:—

- (1) Trinidad Channel, shallow water.
- (2) Tom Bay.
- (3) Cockle Cove.

#### STRONGYLOCENTROTUS, sp. inc.<sup>2</sup> (Plate VIII. figs. 3, 4.)

This specimen is at once distinguished by the very remarkable arrangement of the arcs of pores, which are so little bent as to be better indeed called rows, and are, above the ambitus, set very

<sup>1</sup> Molina, 'Saggio sulla Storia nat. del Chile,' Bologna, 1782, p. 200.

<sup>2</sup> I was for a long time inclined to regard this specimen as a representative of a new species; but a long and close study of other members of the genus has convinced me that the form of the arc of pores may vary very considerably during growth. I give a full description and figure of it, to exhibit the marked differences which obtain between it and the adult.

nearly vertically; below the ambitus and approaching the actinostome the rows become considerably flattened out and take on a more horizontal direction. Test not thick, very nearly circular, a good deal flattened; spines rather long, greenish, with (when dry) a reddish purplish tip; in each area there are two rows of primary tubercles, of which the interambulacral are considerably the larger; in both sets the diminution in size on the actinal surface is very rapid and very marked; a row of small tubercles, separating the two rows of primary tubercles, extends from the actinostome to some way above the ambitus, in the ambulacral area; there are but few secondary tubercles, on each coronal plate; and as the plates are high, there is no appearance of crowding. The poriferous zones are of a greenish-grey colour, and the two inner or upper pairs of pores are placed at a little distance from the outer or lower six pairs of pores; the spaces between the primary tubercles of the ambulacral area are of a reddish colour.

The actinostome is moderately large; but there are no deep cuts, and no large plates developed on the buccal membrane. As in *S. bullatus*, the ridge connecting the auricles is exceedingly low; the abactinal system is comparatively small, the number of anal plates not small; the madreporic is not much larger than the genital plates. As in *S. bullatus*, none of the ocular plates reaches the anal area. I cannot say whether the presence of short white spinous tubercles rising up so as to form a kind of anal tube is an individual peculiarity of the specimen under description.

The following are the more important measurements:—

Diameter of test.	Height of test.	Diameter of			Ambul. area.	Interamb. area.	Length of spine.
		actino- stome.	abactinal system.	anal system.			
39	21	13	8.5	5	9	11.5	22

One specimen. Tom Bay, 0-30 fms.; bottom, sand, kelp, and mud.

#### *ECHINUS MAGELLANICUS* (Philippi).

*E. magellanicus*, Philippi, Archiv für Naturg. xxiii. p. 130 (1857).

Two species of the genus *Echinus* have been recorded from the Straits of Magellan, *E. magellanicus* and *E. margaritaceus*. Without entering into any general discussion of their peculiarities, it will be sufficient to point out (in consequence of the somewhat contradictory statements that have been put out regarding them) that *E. magellanicus* can be readily distinguished by its larger number of primary tubercles. No specimens of *E. margaritaceus* were obtained in this collection. Those of *E. magellanicus* are all small in size. They were taken at:—

- (1) Tom Bay.
- (2) Cockle Cove.
- (3) Trinidad Channel.

(4) 36° 47' S., 55° 17' W. This is, I believe, the first recorded notice of the presence of *E. magellanicus* in any other region than the Straits of Magellan<sup>1</sup>; but the officers of the 'Challenger' Expedition dredged specimens from the Marion Islands and Prince Edward's Island, as well as at Station 147 (between Marion Islands and the Crozets) and Station 315 (north of the Falkland Islands)<sup>2</sup>; and the views of Studer as to the connexion in earlier periods of the world's history between such points as the southern portion of South America, the Falkland Islands, South Georgia, and the Crozets are thereby strengthened<sup>3</sup>—so far, that is, as forms with free-swimming embryos can offer any evidence at all on the point.

(5) Some very small specimens, which are, I believe, the young of this species, were obtained at Elizabeth Island.

## ASTEROIDEA.

### ASTERIAS.

The species of this genus which have come in this collection afford no exception to the rule that in it the process of determining the species is accompanied with very considerable difficulty.

An opportunity may, perhaps, be now taken to point out that the specific name *mollis*, applied by Studer to the new sexradiate form which he found on the west of Kerguelen<sup>4</sup>, cannot stand for it, as it was used by Captain F. W. Hutton five years earlier for a quinqueradiate form from New Zealand<sup>5</sup> (*bien entendu* that the difference in the number of the rays is not the only one). I would suggest that the name *studerii* should replace *mollis* for the more lately described species.

#### ASTERIAS BRANDTI, n. sp. (Plate IX. fig. 1.)

A single specimen of this species is, unfortunately, considerably injured; of the two arms which have been broken off from the disk, part of one has alone been preserved. Enough remains, however, to enable us to demonstrate a very remarkable similarity and a very remarkable difference between this new species and the *A. meridionalis* of Perrier. In this latter, which was collected by the Antarctic Expedition and has since been obtained from Kerguelen, the greater part of the creature is covered by short delicate spines, each of which is placed on a separate disk of its own. These disks are completely free from granules; but each disk is frequently separated

<sup>1</sup> During the Hassler Expedition specimens were taken at lat. 37° 42' S., long. 56° 20' W.

<sup>2</sup> The specimens from these localities were determined by Prof. Alex. Agassiz.

<sup>3</sup> Archiv für Naturg. xlv. p. 140. Some time after writing the above I found that Capt. F. W. Hutton had (Trans. N.Z. Inst. ix. p. 362) stated his belief that his *E. albocinctus* is the same as *E. magellanicus*. With this opinion of Capt. Hutton's I am not, as at present advised, disposed to disagree; but it may be pointed out that we not only find in this species an interesting example of geographical range, but are also able from it to point the moral of the value of geographical terms as specific titles.

<sup>4</sup> Monatsber. Akad. Berl. 1877, p. 457.

<sup>5</sup> P. Z. S. 1872, p. 812.

from those near it by small aggregations of large granules. Now in *A. brandti* the spines are present and the disks are present, as are, too, the granules, but the granules, instead of separating the disks, are placed upon them.

The species may be thus defined:—Arms five, very long and narrow, decreasing very gradually in width; they are largely covered with disk-like plates which are covered by large granules, with a short white spine in the centre. The adambulacral spines are in two longitudinal rows and subequal; the disk-like plates on either side are closely packed; and their spines are much longer and stouter than those on the dorsal surface. Between these lateral rows, and extending across the arm, there are about eleven disks, which form fairly regular longitudinal rows along the arm. The exceedingly small central disk is not distinguished by any special spines; the madreporic plate is orbicular and near the margin of the disk. Spines all white.  $R=86$ ,  $r=7$ ; or the greater is about twelve times the length of the lesser radius.

One specimen. Trinidad Channel, 30 fms.; bottom, mud.

*ASTERIAS ALBA*, n. sp. (Plate IX. fig. 2.)

Arms five, rather stout, narrowing rather rapidly toward the end. Spines mere projections on the dorsal and lateral surfaces; adambulacral spines in two rows, delicate and closely set; these are flanked by two rows of stouter conical spines, which gradually diminish in size as they approach the distal end of the arm. External to these rows there is a bare band, which occupies the greater part of the side of the arm, and is separated from the barely convex dorsal portion by a somewhat indistinct line of short inconsiderable spines. The spines on the dorsal surface are no better developed; and the most important series is the median row of small projections. The species presents some resemblance to *A. antarctica*; and this is specially well seen in the reticulated appearance produced by the mode of arrangement of the calcareous bars which make up the dermal skeleton. The disk is very small, and not provided with any longer spines than the rest of the animal. The madreporic body is of a dead white and difficult to detect.  $R=73$ ,  $r=10$ ; therefore  $R=7.3r$ .

One specimen. Sandy Point, 7-10 fms.; bottom, dead acorn-shells.

*ASTERIAS OBTUSISPINOSA*, sp. n. (Plate IX. fig. 3.)

This species is at once remarkable for its short blunt spines, and for the fringe of short spines which surround the madreporic body; these are about twelve in number, while in the long-armed *A. spectabilis* of Philippi there are said to be eighteen. The adambulacral spines are arranged in two longitudinal rows, and are much less strong than the other spines; those of the inner row are the shorter. Beyond these there are three fairly regular rows of blunt spines, the innermost of which only extends about halfway along the arm. The side of the arm, bare of spines, is limited below by

the outermost of these rows, in which the spines are ordinarily arranged in pairs, and above by a row of, if any thing, shorter spines; these are sometimes, towards the apex of the arm, arranged in pairs. On the dorsal face of the arm there are three sets of short spines, arranged irregularly in pairs, and extending along the arm; the median row is by far the most regular. The arms are five in number; but one was broken off from the specimen under description; of the four remaining two are white and two are black on their dorsal surface; the rest of the creature is white, as are all the spines. The disk is exceedingly small and is but sparsely provided with spines; the radius of the disk is 14 millims., the length of the longest arm 70 millims.; so that  $R=5r$ .

One specimen. Sandy Point, 9-10 fathoms; bottom, sand.

*ASTERIAS CUNNINGHAMI*, Perrier.

*A. cunninghami*, Perrier, Rév. Stell. 1875, p. 75; Ann. Nat. Hist. (4) xvii. p. 36.

General appearance not unlike that of *A. rubens*. Arms five, elongated, gradually and regularly decreasing in width; disk small; madreporic plate obscure. A single row of adambulacral spines, flanked by a double longitudinal row of spines, every two being closely appressed; the sides of the arms are occupied by a number of small tubercles. On the dorsal surface of the arms the tubercles are closely packed both towards the tip and the base, while they are much more sparse in the middle third of arm and on the central portion of the disk itself. Colour orange.  $R=30$ ,  $r=8$ , therefore  $R=3.75r$ . Breadth of arms at base 9 millims.

Three perfect specimens, of which one is much smaller than the other two; they are all smaller than the type specimen. Tom Bay, 0-30 fathoms; bottom, rock, kelp, and sand.

*ASTERIAS RUPICOLA* (?).

*Asterias rupicola*, Verrill, Bull. U.S. Nat. Museum, i. iii. p. 71.

There are in the British Museum three specimens, which were collected by Dr. Cunningham, but to which no definite locality is attached; these specimens I now, though with very considerable hesitation, assign to the Kerguelen form lately described by Prof. Verrill. The hesitation is not due to any insufficiency on the part of the description, which is by the hand of a master, but from the fact that in some points, such as the proportion of the greater and lesser radii and the breadth of the arms at their base, the specimens now in hand have the arms longer and more slender than those of Mr. Verrill's specimens. When, however, we take into account the appalling number of specific terms which have been applied to forms belonging to the genus *Asterias*, we shall, I think, act more wisely if we refrain from adding to these synonyms on the score of differences in character which may at some future time be shown to be due either

to differences in modes of preservation, or to be such as come within the range of individual variations.

*ASTERIAS NEGLECTA*, sp. n. (Plate IX. fig. 4.)

The species now to be described is represented by a specimen which was brought home by Dr. Cunningham, and which has as yet remained undescribed. It resembles *A. meridionalis* in having a groove between the spines of the actinal and abactinal surfaces, in which the papular spaces are largely developed; but it is more closely similar to *A. brandti* in the characters of its abactinal surface, for granules are developed on the spine-bearing plates.

Arms five, elongated, and tapering gradually; the adambulacral spines are arranged in two rows, are cylindrical in form, and are about 2 millims. long at the middle of the arm; on either side of these there are three or four irregular longitudinal rows of short spines. The plates on the abactinal surface are richly covered with granules; these are closely set, are irregular in shape, and are each provided with a single short spine, which is hardly lighter in colour than the brown plate itself; the disks are somewhat irregularly arranged in six rows; and occasionally there are two spines on one disk. At the side of the arm and above the already mentioned groove there is a row of spines: these are set singly at the base of the arm; but they rapidly become double, and occasionally a third spine appears. The deeply set madreporic plate is placed quite at the edge of the central disk, on which the spine-bearing plates frequently have two or even three spines developed.  $R=83$ ;  $r=12$ ; or the greater radius is about seven times the less. Greatest breadth of arm 19.5 millims.

One specimen, Gregory Bay. Coll. Cunningham<sup>1</sup>.

LABIDIASTER, Lütken, 1871 (Vidensk. Medd. 1871, p. 289).

I have no hesitation in placing the specimen now to be described in this genus; the only point in which it does not satisfy the definition of Dr. Lütken is in the number of its arms. The learned naturalist who defined this genus says "brachia numerosa, triginta vel plura." The species now to be described has in all only twenty-six arms; but I cannot think that this difference is, at the utmost, any more than a very poor specific character. The size of the specimen collected by Dr. Cunningham is rather less than half that of the one described by Lütken. If it is a different species from that form, the specific characters are not as yet sufficiently well marked to enable us to define it as such. I look upon it as a young specimen of *L. radiosus*, Lütken; if it shall turn out to be distinct,

<sup>1</sup> I subjoin a list of the other species from this region which are represented by specimens in the national collection:—

*A. sulcifera*, Perrier. Cape St. Vincent, Fuegia.

*A. rugispina*, Stimpson. Gregory Bay.

*A. perrieri*, Smith. Kerguelen.

*A. meridionalis*, Perrier. Kerguelen.

*A. antarctica*, Lütken.

<sup>2</sup> So Studer found a specimen with 29 arms (MB. Akad. Berl. 1876, p. 457).

it will be easy enough to call it *L. luetkeni*. I add the following short description :—

Perfectly flat, with twenty-three completely developed and three less-well-developed arms; brown above, with a dark line running round the disk, cream-white below; the arms are very slender, and widest at some little distance from their point of insertion into the disk. The small and white madreporic plate lies near the dark circular line, and is fringed with a few spines. The spines on the arms form a median and a lateral series; but the former does not extend along the whole length of the ray; the arms themselves have the appearance of being ringed externally, owing to the transverse disposition of these spines; single or bifurcate spines, not very regularly arranged, are to be found on the disk, but are not numerous.  $R=51.5$ ,  $r=14$ .

Trinidad Channel, 30 fathoms.

It is of interest to point out that in the three partly developed arms the ambulacral suckers are closely packed, and do not exhibit a definitely paired so much as a pycnopod arrangement; and this, which is characteristic of the adult *Asterias*, is *pro tanto* of value in supporting Dr. Lütken's view as to the affinities of the genus now under examination. The fact of the presence of three arms smaller than the rest should, further, be compared with the remarks on this subject made by Dr. Lütken (and translated in Ann. & Mag. Nat. Hist. ser. 4, xii. p. 336).

#### PENTAGONASTER SINGULARIS, M. & Tr.

*Goniodiscus singularis*, Müller & Troschel, Archiv für Naturg. (1843) ix. p. 116.

*Pentagonaster singularis*, Perrier, Rév. des Stell. p. 222.

One specimen, obtained in Tom Bay, 0-30 fathoms; bottom, rock, kelp, and mud.

This specimen is interesting as being intermediate in size between the two specimens already possessed by the Museum, and collected by Dr. Cunningham.

#### PENTAGONASTER PAXILLOSUS.

*Astrogonium paxillosum*, Gray, P. Z. S. 1847, p. 79.

*Pentagonaster paxillosus*, Perrier, Rév. Stell. p. 221.

A small specimen ( $R=19$ ,  $r=12$ ; 20 infero-marginal plates), collected by Dr. Cunningham at Sandy Point, must be referred to this species. If it be distinct from it, the distinctive specific characters are not differentiated; the condition of the type specimen, which is dry, prevents a determination of the question whether the Australian form has a glassy spine at each angle of the mouth. If it shall prove to be absent, that character might perhaps be shown to be one of specific value, and would, at any rate, afford a point of distinction between the South-American and the Australian form.

#### CALLIDERMA GRAYI, sp. n. (Plate VIII. fig. 5.)

Arms not long, interbrachial angle rounded;  $R=1.5$ ,  $r=8$ . Ten

marginal ossicles, in both upper and lower series, on the sides of each arm; at the apex of the angle an azygos triangular "anticiinal" plate, as in *Pentagonaster singularis*. The plates vary considerably in the extent to which they are covered with granules, the more distal marginal ossicles having the granules confined to their borders, while in the more internal they are better-developed. The infero-marginal plates are richly covered with spiny tubercles, which are developed into distinct spines, set in tufts, on the ventral ossicles of the disk. On the borders of the ambulacral groove there is a transverse row of three or four well-marked spines; at the oral angle one spine is elongated and has a glassy appearance, so that it is much more conspicuous than the corresponding spine in *C. emma*. Abactinal surface blackish brown, with here and there lighter spots; marginal ossicles all white at the apex of the arm; but some of the more internal are of a lightish brown; ventral surface light brown.

This species is an ally of the *Calliderma emma* of Dr. Gray, which has been so beautifully figured by him in his 'Synopsis' (pl. xv.).

One specimen from Sandy Point, 9-10 fathoms; bottom, sand. A somewhat younger specimen of this species was collected by Dr. Cunningham in the Straits of Magellan.

#### CYCETHRA, nov. gen.

It seems to be necessary to establish a new genus for a specimen which was taken in Trinidad Channel, and which, though generally Goniasterid in character, seems, and that more especially at first sight, to present a combination of characters.

The ambulacral grooves are exceedingly narrow, the actinostome small, not widely open, the modified spines of the mouth-organs generally Goniasterine in arrangement; the ventral intermediate plates continuous, but not imbricated, bearing short spines, which in character and arrangement recall the same parts in *Asterina*. Marginal plates almost completely confined to the sides of the arm and disk; the ventro-marginal plates only just appearing on the actinal surface, and the dorso-marginal on the abactinal only near the tip of the arm; the plates are separated one from the other by a horizontal as well as by vertical grooves. The whole of the abactinal surface is covered with closely packed small ossicles, among which there are no pore-areas. The central disk is large; the arms rather short and slender. No pedicellariæ.

#### CYCETHRA SIMPLEX, sp. n. (Plate IX. figs. 5, 6.)

The following appear to be the specific characters of the specimen obtained:—Adambulacral spines in a single row, not especially subequal, diminishing in size as they pass to the apex of the arm. The spines of both surfaces are short, blunt, almost granular; the marginal plates, with the exception of those near the apex of the arm, are distant almost their own breadth from one another. The ossicles of the abactinal surface are small; and their granules can hardly be said to be produced into spines. The ocular plate is large and white; the madreporic plate is small and white, rather deeply sunken,



simply grooved, and not fringed with spines; it is situated not far from the centre of the disk.  $R=36$ ,  $r=13$ ; the arms are 7.5 millims. wide at the point where they become free from the disk, and 4 millims. at their tip; the adambulacral spines do not exceed 2 millims. in length; the interbrachial angles vary very greatly.

One specimen taken, at 30 fathoms, in Trinidad Channel.

ASTERINA FIMBRIATA, Perrier, Rév. des Stell. 1875, p. 307.

One small specimen, from Cockle Cove, and two still smaller, from Sandy Point, are, with some hesitation, referred to this species. I have not seen M. Perrier's type; and the variation exhibited by the species of this genus at various periods of their lives makes it impossible to speak definitely unless one has in hand a considerable series<sup>1</sup>.

#### ASTROPECTEN.

Two dried specimens of a species of this genus were obtained at a depth of 48 fathoms, in lat.  $32^{\circ} 39' S.$ , and long.  $50^{\circ} 11' W.$  They present a very remarkable resemblance to *A. articulatus*, Say, as figured by Agassiz ('North-American Starfishes,' pl. xix.); and the two specimens also differ in just the same way from one another as do two specimens mentioned by M. Perrier—in the fact, namely, that in one some of the dorsal plates are provided with spines, while from the other such spines are completely absent.

The specimens also differ somewhat from one another in the number of dorsal marginal plates. The length of the greater radius of one specimen is 82 millims., and the number of plates 33; while in the other there are 38 plates, with a greater radius of 81 millims. In the case of both specimens the relation of the greater to the lesser radius is much the same,  $R$  being equal to about 5.75  $r$ , the lesser radius in both specimens measuring 14 millims.

Two large sword-shaped spines, with which a smaller third one is frequently associated, project upwards and forwards from the upper margin of the ventro-marginal plate; they are sufficiently long for the first of each set to extend some way along the side of the dorso-marginal plate next but one in front of it; extending inwards towards the ambulaeral groove, the plates bear, in a somewhat irregularly double series, as many as seven well-developed spines in each set, and in addition to these there are a number of smaller spines and pedicellariæ. From the middle of the arm the spines increase in size towards the angle, and diminish towards the apex. The spines on the adambulacral plates are with difficulty distinguishable: they are arranged in two rows; and those of the inner series are the longer and stronger; there are generally three, more rarely only two, on each plate.

<sup>1</sup> Since writing the above, another example of the same species has been received from Borja Bay, and I have also been able to see Prof. Perrier's valuable essay on the geographical distribution of the Asterida (Nouv. Arch. du Mus. 1878); from this I gather that he seems to be satisfied as to the presence of this species in the Chilean seas (cf. the remarks in the 'Révision,' p. 308).

The madreporic plate is obscured by the paxillæ, which are nowhere arranged in regular rows. The interpaxillar area is 8 millims. wide at the base of the arm, and 1 millim. at the apex; the total width of the arm at the base is 15.5 millims., and at the tip 2.2 millims..

## OPHIUROIDEA.

### OPHIURIDA.

#### OPHIACTIS ASPERULA.

*Ophiopsis asperula*, Philippi, Archiv für Naturg. (1858), p. 267.

*Ophiactis asperula*, Lütken, Addit. ad Hist. Oph. ii. (1859), p. 130, footnote.

*Ophiactis magellanica*, Ljungman, Vetensk. Akad. Förh. 1866, p. 164.

*Ophiactis asperula*, Lyman, Bull. C. M. Z. vi. 2, p. 41.

(1) Port Rosario, 2-30 fms.; bottom, sand and rock.

(2) Tom Bay, 0-30 fms.; bottom, rock, kelp, and mud.

(3) Elizabeth Island, 6 fms.; sandy bottom.

(4) Sandy Point, 9-10 fms.; bottom, mud.

(5) Borja Bay, 14 fms.; bottom, shell and stones.

#### OPHIOSCOLEX COPPINGERI, sp. n. (Plate VIII. fig. 6.)

This species is to be at once distinguished by the irregular distribution of the uppermost row of arm-spines, which are, though not regularly, set almost alternately in an upper and a lower plane.

The disk is rounded in the larger, subpentagonal in the smaller specimen. Arms long, slender, delicately tapering, widest at the base, with three lateral arm-spines, of which the uppermost, which is a little the longest and of about the same length as an arm-joint, is not always placed at the same level, but is not unfrequently higher up or lower down on the side of the arm than is the corresponding spine of the next joint. The three or four outer mouth-papillæ are short and spinous; the most central is broadened out and pectinate at its margin, closely resembling the teeth, of which there are at least three in each jaw. The buccal shield is only visible when the skin is removed, is somewhat ovoid, with the narrower end internal. There is a deep notch on the upperside of each arm-joint, so that the dorsal plates are only near one another in the middle line, but the calcareous plates do not here even touch one another; along the upper median line there runs a well-marked groove, an indication of which, as passing all along the arm, can be made out even before the skin is removed; the lower arm-plates are regular and oblong. Genital slits rather long.

The following are the more important measurements of the largest specimen:—Diameter of disk 20.5 millims.; length (longest) arm 80 millims.; breadth of arm (at base) 3 millims.; length of genital slit 4 millims.

Three specimens, one with the disk injured, were collected at Tom Bay, 0-30 fms.; bottom, rock, kelp, and mud.

## ASTROPHYTIDA.

The two specimens of this group which were received from the Straits of Magellan belong to the genus *Astrophyton*; and both appear to be representatives of a species hitherto undescribed. So far as I know, the only species which has yet been recorded as coming from the same region is the *A. pourtalesi* of Lyman, which was obtained off the eastern coast of Patagonia<sup>1</sup> during the Hassler Expedition. The species now to be described falls into the same group as it, belonging, as it does, to the series which, as Prof. Lyman has shown, is characteristic of the temperate seas, and in which the forkings are, as compared with such forms as *A. muricatum*, few and distant.

## ASTROPHYTON LYMANI, sp. n.

Radial ribs prominent, compressed laterally, their narrow ridge with short conical or rounded spiniform processes; somewhat similar spines are found in medium quantity projecting from the thick brown skin of the interradial spaces. Madreporic body single, large; the tentacle-scales extend nearly as far as the mouth, and soon become arranged by fours in each transverse row.

The following are the more important measurements:—Diameter of disk 45 millims.; breadth of arm within disk 7·5 millims.; breadth of arm just without disk 6 millims.; greatest width of madreporic body 4·5 millims.; genital slits 4 millims. long.

	millim.
Distance from mouth to 1st fork .....	15·5 <sup>2</sup>
"      "      1st to 2nd " .....	15
"      "      2nd to 3rd " .....	21
"      "      3rd to 4th " .....	25
"      "      4th to 5th " .....	23
"      "      5th to 6th " .....	28
"      "      6th to 7th " .....	36
	<hr/> 163·5

There are ordinarily two terminal branches of no great length. The mouth-parts are all simple, spiniform, and rather numerous. The madreporic body, which in the specimen under description is broken up into several parts, is placed quite in the apex of the interbranchial angle, so that it is almost semilunar in form; in the dry example, at any rate, it is quite easy to distinguish. The inner lip of the genital slits is fringed with a few spines or spinous granules. The dark-brown interradial spaces on the actinal surface contain, except at their peripheral margin, a considerable number of small white granules, and they are separated from the corresponding space on the upper surface by a white calcareous band, altogether similar to the band which forms the base of the radial triangular space, and, like them, provided with some short blunt or conical projections;

<sup>1</sup> Ill. Cat. M. C. Z. viii. 2, p. 28.

<sup>2</sup> Greatest length always given.

there are, however, about twice as many of these projections in the interradii as in the radial bands. There are no spines or other processes on the dorsal aspect of the arm, which is only closely granulated; no indication of any banded arrangement of the granules in correspondence with the joints of the arms can be made out till the third bifurcation is passed. The tentacle-scales are ordinarily arranged in fours, and are short, spiniform, and subequal; the pore nearest to the mouth seems to be always without the scale; the next may or may not have one; the third has one; the fourth or fifth pore has two, the seventh or eighth three, and the tenth or eleventh four. The arms completely white, as are the radial ribs and the edges of the genital slits; the rest of the disk is of a brown colour, which is relieved by the white spinous granules.

The smaller of the two specimens of *A. pourtalesi* (Lyman) had the diameter of its disk (63 millims.) nearly 20 millims. longer than the specimen now under examination; and it is possible that the affinity between the two species may hereafter be shown to be closer than we are yet justified in supposing it to be. Whatever the result, the suspicion induces me to place with *A. lymani* a second and smaller example of the same genus. It is to be distinguished from it by several points, but every one of them may, I think, be more rightly ascribed to differences in age and in sexual condition than to inherited distinguishing characteristics:—

(1) The mouth-slits are very distinctly rounded; and the whole actinostome forms a rosette.

(2) The interbranchial spaces are sharply incised at the edge of the disk.

(3) The radial ribs, though distinct, are not prominent; and the granulation on them and on the interradii spaces of either surface is less differentiated than in the larger form.

(4) Transverse bands of granules can be detected on the dorsal surface of the arms quite close to the disk.

(5) The fifth difference lies in the smaller number of the tentacle-scales; and that is one of far greater importance than any of the preceding differences: most of the tentacle-scales are arranged three in a row.

Perhaps a larger series may, contrary to what ordinarily happens, enable us to definitely distinguish the two forms.

The larger specimen was taken in Trinidad Channel, at a depth of 30 fathoms; bottom, sand. The smaller at Port Rosario, 2–30 fms.; bottom, sand and rock.

### HOLOTHUROIDA.

As I have already remarked, this class is very feebly represented. I have here only to direct attention to two species.

#### CUVIERIA ANTARCTICA.

This species, first described by Philippi (Arch. f. Nat. 1857, p. 133), has since been recorded by Studer (Monatsb. Ak. Berl.

1876, p. 453), from Tuesday Bay, Straits of Magellan. The difference between the size of the largest specimen now under examination and the object of Philippi's description is considerable; the latter measured  $4\frac{1}{2}$  lines long and 3 lines broad, whereas that from Dr. Copping is 43 millims. long and 25·25 millims. broad. Studer's specimens afford an intermediate size, for they were 40 millims. long and 20 millims. broad. The other specimens give the following measurements—5·5 millims. and 4·25 millims., and 4·5 and 3·25, respectively, for their length and breadth.

(1) 2 small specimens, Portland Bay, 10 fms.

(2) 1 specimen, Latitude Cove.

CHIRODOTA PURPUREA, Lesson, Cent. Zool. p. 155; Studer, Sitzungsab. Akad. Berl. 1876, p. 454.

I refer to this species four small specimens which were collected off Elizabeth Island in six fathoms of water. For the present I must abstain from offering any opinion on the validity of the new genus *Sigmodota*, which Herr Studer proposes for the reception of this species.

## X. CŒLEENTERATA.

By STUART O. RIDLEY.

(Plate VI.)

ACTINOZOA.

ZOANTHARIA.

PARACTIS ALBA, Studer?

*Paractis alba*, Studer, M.B. Ak. Berlin, 1878, p. 545, pl. v. fig. 19.

Two specimens in spirit, without any distinct coloration, except a faint cream-colour on the disk and tentacles. The tentacles are present, in the least contracted of the two specimens, in numerous cycles, short, thick, the central ones tipped by a slight distinct point; they decrease in size towards the margin of the disk. The base appears to have been broader than the disk in life; and the height of the body is about equal to the breadth of the base. The sides of the body are smooth, with the exception of some more or less distinct ridges which mark the position of the mesenteries. Height of largest specimen 22 millims., extreme breadth of disk 19, base 22.

*Hab.* Trinidad Channel, S.W. Chili, 60 fathoms.

The identity of this species is doubtful. The tentacles occur in only two cycles in Studer's specimen; in the longitudinal striation of the body, however, it resembles this form.

PARACTIS sp. inc.

One spirit specimen, coloured as the preceding species. The disk is much everted, and touches the base; nearly half of its surface is bare, the margin being occupied by two cycles of thick tentacles

and two of small ones, which are exterior; all are entirely retracted. The sides of the body are almost hid by the disk in its present state: they are about 5 millims. high; the base is 11, and the disk 13 broad. The only unevenness of the body-surface is an occasional indication of the mesenteries.

*Hab.* Same as preceding.

It is obviously impossible to identify these specimens satisfactorily by the few characters left to them.

Two other Actinians are represented, each by a minute specimen from Coquimbo Bay, Chili. One is almost entirely black in spirit, the other nearly white, apparently with black-tipped tentacles. They answer to none of the species enumerated in Gay's 'Chili' with any certainty; possibly the light-coloured species may be *Actinia nivea* of Lesson (Voy. de Coquille, Zooph. p. 80, pl. iii. fig. 8). The depth is 4-8 fathoms.

*AXOHELIA BRUEGGEMANNI*, sp. n. (Plate VI. fig. 7.)

Corallum subcylindrical, branching. Cœnenchyma compact; surface covered with minute pointed tubercles at some distance apart, and marked by very slight and irregularly developed longitudinal ridges. Calicles round or slightly oval, the long axis following that of the corallum itself; maximum diameter 1 millim., generally more or less raised above surface. Septa 8 in number, in one cycle, equal in size, commencing outside the calicle as ridges, and projecting above its edge as prominent square-topped teeth; at a distance inwards varying from one fourth to half the radius they fall away perpendicularly and join the columella; a second cycle is indicated by a slight swelling in the calicular rim between each of the two primaries. Columella mound-like, culminating in a short, sharp median point. Interseptal spaces deep. Colour of corallum white.

*Hab.* Victoria Bank<sup>1</sup>, off S.E. Brazil, 33 fathoms; also (specimen already in British Museum) West Indies.

*Obs.* The specimen from the West Indies already in the Museum, but not described, has the form of (apparently) two stems which have fused laterally at one point. It bears several short tubercular processes, and is forked at the upper end; it measures 80 millims. in length by 10 in maximum thickness. The calicles differ from those of the Brazilian specimen in being always round, in being little, if at all, salient, and in the superior radial length of the septa; it also differs immensely from it in relative stoutness, as the other measures only 15 millims. in length by 2 in thickness. In both cases the stem has a somewhat oval section; the calicles are between 1 and 2 millims. apart. The West-Indian specimen was probably a dead one and somewhat overgrown; so it is fortunate that one evidently taken alive has been secured. The differences between the two are important, especially the shape of the calicles, but apparently not sufficient to justify their separation. This species is named after the lamented author who was the first to recognize

<sup>1</sup> Not marked in the ordinary maps; its position is lat. 20° 42' S., long. 37° 27' W.

its specific distinctness. It differs from the rest of the genus in the number of its septa.

#### ALCYONARIA.

##### PRIMNOELLA AUSTRALASIÆ, Gray.

*Primnoa australasiæ*, Gray, P. Z. S. 1849, p. 146, Radiata, pl. ii. figs. 8, 9.

*Primnoella australasiæ*, Gray, P. Z. S. 1857, p. 286.

A single specimen, about 54 centims. long; in spirit. It agrees well with the numerous specimens already in the Museum. Close to the present base (which, however, is not the original base, as it has been snapped off from a longer specimen) an empty shark's egg is attached; its two fastenings having, apparently, modified the growth of the cortex at their point of attachment.

*Hab.* Trinidad Channel, S.W. Chili, 30 fathoms, sandy bottom.

#### HYDROZOA.

##### HYDROIDEA.

##### LAFOEA DUMOSA, Fleming.

*Sertularia dumosa*?, Montagu ap. Fleming, Edin. Phil. Journ. ii. p. 83.

*Lafoëa dumosa*, Hincks, Brit. Hydr. Zooph. i. p. 200, ii. pl. xli. fig. 1.

Abundant in the creeping form. The calicle is simple, or else possesses from 1 to 4 rings (old mouths) at different heights.

*Hab.* Trinidad Channel, S.W. Chili, 30 fathoms, on *Sertularella*.

##### EUDENDRIUM ARBUSCULUM, d'Orbigny? (non T. S. Wright).

*Tubularia arbuscula*, d'Orbigny, Voy. Amér. mérid. p. 28, pl. xiii. figs. 11, 12.

The lower part of the stem is made up of contorted tubes, and the colony resembles *E. rameum* closely in external appearance; and is apparently nearly related to it. D'Orbigny makes the stem of about one diameter throughout, but as in the magnified drawing he depicts part of it as thicker than the part below it, which is contrary to analogy, it does not follow that his other figure is correct; according to that, the origin of the branchlets is dorsal or ventral, not lateral, and they take a twist to the side on leaving it. The stem in the present example is always ringed between the branches, though to a varying extent, and the branchlets are annulated for most of their length. Characters of polypites and gonophores unknown. Maximum height about 80 millims. Several colonies occur together.

*Hab.* Trinidad Channel, S.W. Chili, 30 fathoms, from stem of seaweed?

##### HALECIUM DELICATULUM, Coughtrey.

*Halecium delicatulum*, Coughtrey, Ann. & Mag. Nat. Hist. ser. 4, xvii. p. 26, pl. iii. figs. 4 & 5.

Several colonies, of 27 millims. height, appear to represent the above

species; the stem is about 2 millims. thick at the base, and is strong and of a dark-brown colour there, but pale yellow at the apex; the pedicle of the hydrophores (*Allman*) varies somewhat in length; the first cup, followed by a joint, is generally succeeded by a rather long space devoid of cups, which then appear close together up to the number of four in some cases, in others at intervals as great as that between the first and second. Stem generally simple, but in the largest example (twisted round by several tubes, possibly foreign to it) at the base.

*Gonosome* (not previously described). Gonophores inserted on pedicle of hydrophores, just below the first joint, by a stalk; they are transversely oval in outline, and have a thin, very pale capsule.

*Hab.* Sandy Point, 7-10 fathoms; on large worm-tube.

#### SERTULARELLA JOHNSTONI, Gray.

*Sertularia johnstoni*, Gray, Dieffenbach's New Zealand, ii. p. 294.

Several specimens, generally pale brown in colour; the hydrothecæ moderately distant, and elongate and free to a great extent, tapering almost from base, or slightly swollen just above it; lateral teeth very small, lip sometimes ringed. Gonothecal tube varying from a short and straight to a prominent trumpet-shaped opening. Internodes generally include a large number of calicles, joints very faintly marked; oblique rings of stem scanty, often wanting.

A doubtful specimen from Sandy Point, 7-10 fathoms, has the calicle considerably swollen at base, and bent outwards at a spot about two thirds of its length from that point.

*Hab.* Trinidad Channel, S.W. Chili, 30 fathoms; also Sandy point, 7-10 fathoms, on large worm-tube.

#### SERTULARELLA POLYZONIAS.

*Sertularella kerguelensis*, Allman, Ann. & Mag. Nat. Hist. ser. 4, xvii. p. 113.

*S. polyzonias*, Allman, Phil. Trans. clxviii. p. 282, footnote.

Growing to upwards of an inch in height. The orifice of the gonangium forms a very short tube; the annulation is continued to within one quarter of the length from the pedicel. Several colonies. Represents the southern variety now united to *S. polyzonias*.

*Hab.* Trinidad Channel, S.W. Chili, 30 fathoms., on a stiff stem (*Fucus*?); and ? Sandy Point, 7-10 fathoms, on worm-tube (young, without gonangia).

#### SERTULARIA TRISPINOSA.

*Sertularia trispinosa*, Coughtrey, Trans. N.Z. Inst. vii. p. 284, pl. xx. figs. 14 & 15.

Rises from a creeping fibre. Growth upright; branches very distinct, and given off equally on both sides. Maximum height quite 100 millims. No gonangia observed.

*Hab.* Elizabeth Island, Straits of Magellan, 6 fathoms, on stem of seaweed, in company with Polyzoa.



SERTULARIA FUSIFORMIS, Hutton? (non Hincks).

*Sertularia fusiformis*, Hutton, Trans. N.Z. Inst. v. p. 257; Coughtrey, Trans. N.Z. Inst. vii. p. 285, pl. xx. figs. 21-23.

This species appears to be represented by four specimens. The growth is very strong, and the calicles large ( $\cdot 425$  millim. in diameter at their middle); but they should be described as quadridentate, though the interior and exterior teeth are very short. The crest, described by Coughtrey on the upperside of the gonangium, is here, at any rate, a tube which opens in the side of the gonangium. This is certainly not the species assigned to Hutton's species by Allman (Journ. Linn. Soc. xii. p. 263) under the name of *S. episcopus*.

*Hab.* Trinidad Channel, S.W. Chili, 0-30 fathoms, on coral &c.

### HYDROCORALLINÆ.

LABIOPORA ANTARCTICA, Gray.

*Porella antarctica*, Gray, Ann. & Mag. Nat. Hist. ser. 4, ix. p. 482; P. Z. S. 1872, p. 746, pl. lxiv. fig. 4.

*Labiopora*<sup>1</sup> *antarctica*, Moseley, Phil. Trans. 1878, pt. ii. p. 476, pl. xxxv. fig. 5.

A spirit specimen, the first obtained. It differs from the type specimen somewhat in habit. Instead of originating by a very broad stout stem, giving off stout branches which branch into rapidly tapering pointed twigs, the frond commences to branch almost at its base, the branches being cylindrical and only about half the diameter of those of the type specimen, which is of about the same size; hence their terminal divisions taper much less. The lips of the "nariform projections" are, as a rule, thicker than in the other case; and hence their contained pores are scarcely visible to the naked eye. The specimen, which was obtained on the 29th of March, is well provided with ampullæ (absent in the type specimen), about one millim. in diameter, projecting as low domes between the nariform projections over the greater part of the branches, some having already burst. The stock would therefore appear to be *female*; but examination of decalcified fragments failed to detect generative organs with certainty. The cœnosarcal canals are from  $\cdot 035$  to  $\cdot 07$  millim. in diameter; the meshes between them vary from the former diameter to about  $\cdot 14$  millim.

*Hab.* Trinidad Channel, S.W. Chili, 30 fathoms (coated with *Cellepora*, Sertularians, &c.). (The type specimen was from a bank to the east of Tierra del Fuego.)

<sup>1</sup> *Characters of the Genus Labiopora*.—With Mr. Moseley's concurrence, I propose that the distinctive characters of the dactylopores of his genus should be restated as follows:—"Dactylopores devoid of styles; two kinds present, the one opening on the general surface of the cœnosteum, the other within special areas bounded by nariform lips." This change is necessitated by the discovery of the following new species. The term "few" should be omitted from the description of the branches, and also the statement that the nariform projections are inclined towards the tips of the branches and have their rounded margins on this side.

*LABIOPORA MOSELEYI*, sp. n. (Plate VI. fig. 11.)

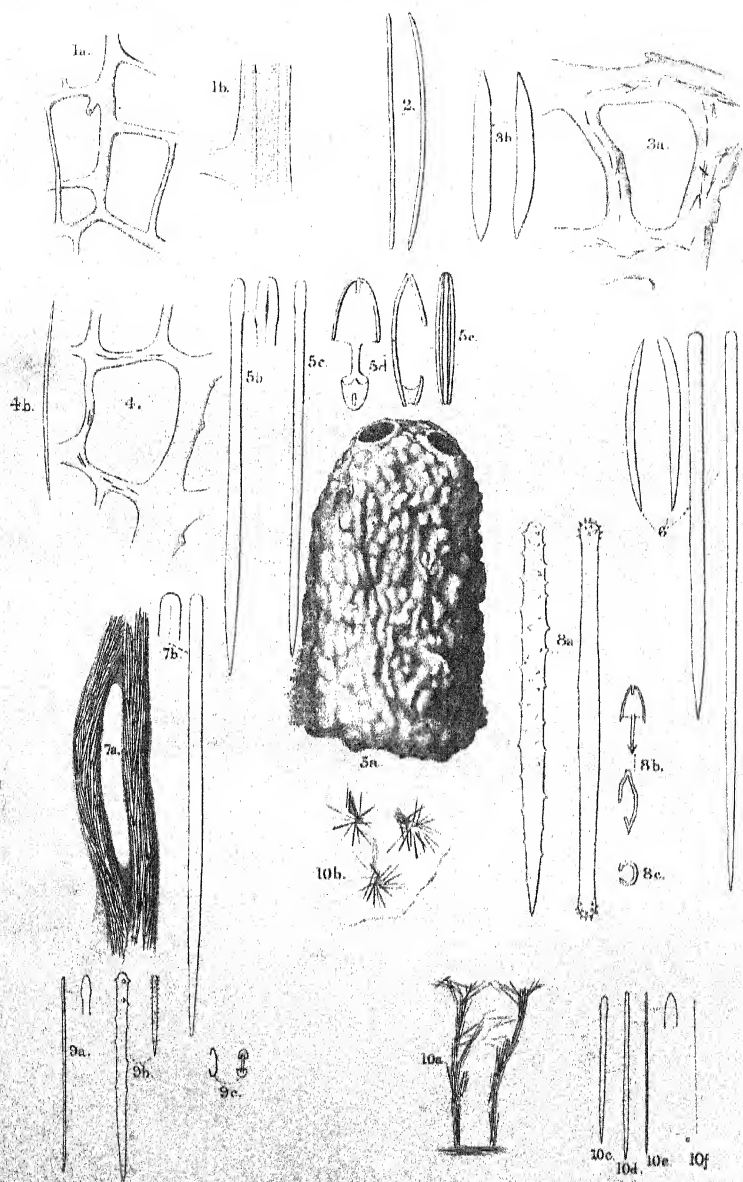
An upright well-branched frond, rising from a somewhat spreading base and thick stem; branches lying almost entirely in one plane, all somewhat flattened from front to back except the terminal ones, which are cylindrical and taper slightly to their generally somewhat blunt points; anastomosis between branches frequent. Colour of stem, base, and anterior and posterior aspects of main branches pale vermillion in the dry state, the same parts of the terminal branches and the lateral portions of the main ones deep vermillion. An anterior clearly distinguishable from a posterior surface, by the development on it of numerous tubercles, chiefly in the terminal branches, which are very slightly indicated on the latter. Surface minutely reticulate, covered (slightly on the anterior face of chief branches and stem, thickly on lateral faces of main branches and on anterior and lateral faces of terminal branches) with small rounded tubercles, varying in height up to about .4 millim., the largest generally pierced by dactylopores. Dactylopores differing little in size, *i. e.* long diameter from .1 to .14 millim.; either round or oval; of two kinds, either (i) placed in the general surface of the corallum, or (ii) in the side or near the apex of a tubercle, forming a slit in its side; the tubercle in this case has a horseshoe-shaped outline, but with a very thick convex side, as the dactylopore never occupies more than half the apex of the tubercle, and is generally dominated by the superior height of the apex of the tubercle; no styles visible. Gas-tropores found accompanying dactylopores, also to some extent alone on interior surface of the larger branches; round, provided with deeply-set styles resembling camel's-hair brushes, diameter from .32 to .35 millim., each generally accompanied by one tubercular dactylopore and one to three surface ones. Male gonangium spherical, closely packed with oval or globular refringent pale reddish-yellow cells with transparent contents. Cenosarc cal-system closely reticulate; meshes generally about same diameter as the canals which form them, *viz.* .035 to .07 millim.

*Examined.* Dry, and by decalcification and subsequent mounting of pieces in glycerine.

*Hab.* Port Rosario, S.W. Chili (on the north side of chief island of Madre-de-Dios archipelago), 2-10 fathoms, on a piece of calcareous rock.

*Obs.* This Coral is of great interest as being closely allied to the preceding species, the only one known hitherto of the genus *Labiopora*, previously known only by a single dry specimen. It also is represented by a single dry specimen, but of greater size, measuring 9.5 centims. in extreme (present) height and 13.4 centims. in extreme present breadth; the contrast between the pale-red colour of the stem and the deep colour of the branches gives it a fine appearance. The gonangia were not found abundantly, perhaps owing to the early time (March), at which it was taken. It differs from *L. antarctica* in having an anterior distinguished from a posterior surface, in the small and uniform size of all the dactylopores, and in their being, when present on the tubercles, mere excavations in their sides; for the







cases, therefore, the descriptions here given may be considered, so far as they go, as revisions of the species in question; I believe that such revisions of many of the current species are urgently needed.

Order CERATINA, Carter.

APLYSINA (?) REGULARIS, sp. n. (Plate X. fig. 1.)

Surface even, set with the slightly projecting ends of the primary skeleton-fibres at intervals of about  $\cdot 5$  millim. Vents inconspicuous. Skeleton regular, of primary fibres at right angles to surface, average greatest diameter  $\cdot 057$  millim.; and of secondary fibres, parallel to the surface at regular intervals between the primaries, average greatest diameter about half that of the primaries. Primary fibre pale amber-colour, composed of a multilaminar horny wall with a thick innermost lamina, enclosing a faintly granular axis closely resembling the wall in nature of substance; axis about one third the diameter of the fibre. Secondary fibre paler, generally fibrillated to its centre.

*Examined.* In spirit and by mounting in balsam.

*External Characters.* Form incrusting. Consists of a sheet of substance about 2 millims. thick, with a level surface, spreading irregularly over about one square English inch of an immense flexible worm-tube. Texture soft, very elastic. Colour (in spirit) pale grey. The surface appears glossy, and is set with a number of minute projecting points, which occur with some regularity at about  $\frac{1}{2}$ -millim. intervals over it.

*Vents.* None apparent. *Pores* scattered between surface-points,  $\cdot 04$  to  $\cdot 1$  millim. in diameter.

*Main Skeleton.* Composed of a set of primary fibres running outwards at right angles to surface, and projecting by attenuated points to a distance of from  $\cdot 14$  to  $\cdot 32$  millim. from the surface (they are distant from each other at the surface  $\cdot 35$  to  $\cdot 7$  millim.), of a secondary set, connecting these, approximately at right angles to them, distant from each other by  $\cdot 18$  to  $\cdot 36$  millim., and of a tertiary set, running parallel to the primary fibres and connecting the median portions of the secondary fibres. This tertiary set is not always so fully developed as to extend from the base to the surface of the Sponge; but it is generally represented by a fibre or two in the interval between each two primary fibres; it may possibly prove to be merely the young stage of the primary fibres, from which it differs in its diameter and structure, being about half as broad as an average primary fibre, and having but a thin uni- or bilaminar outer wall, and pale yellow colour, also apparently in not terminating on the surface by a point: it may give rise to a primary fibre.

*Hab.* Sandy Point, 7-10 fathoms, on worm-tube.

*Obs.* This is probably quite a young specimen; its habits and size, as compared with those of the other members of the genus *Aplysina*, seem to show this. The extremely slight difference in appearance between the horny wall of the primary fibre and its granular axis distinguishes it from most, if not all, other *Aplysinæ*.

The great regularity of its skeleton, and its distinction into two kinds of fibres differentiates it from *Dendrospongia*, Hyatt, as well as from the other known species of its genus. The characters of the axial fibre-substance distinguish it from *Verongia*, Bowerbank.

Order PSAMMONEMATA, Carter.

*HIRCINIA HISPIDA*, Lamarck (sp.).

*Spongia hispida*, Lamarck, Ann. Mus. Hist. Nat. xx. p. 452.

*External Characters*<sup>1</sup>. The single (spirit) specimen agrees fairly well with the characters assigned to this species by Lamarck (*l.c.*), and with the specimen of the species already in the British Museum. It being, however, evidently young, the *branching* character is no more than indicated by the extension outwards of a rounded lobe from each side; and as it is a well-preserved spirit specimen, the small foramina of Lamarck's description and of the dried specimen are wanting. It is sessile by a broad base, and suboval in outline, the long axis extending from side to side. Surface uneven, rendered coarsely hispid by the projecting ends of the primary skeleton-fibres, arranged at intervals of from .5 to 1.75 millim. (to 2 in the dried state). Colour in spirit dark brown, slightly rufous; of dry skeleton, pale yellow-brown.

*Vents* few, round; diameter in spirit 1.5 millim., in dried specimen 2 to 3.5 millims. *Pores*?

*Skeleton*. Consists of a set of stout primary, generally sand-cored, fibres running outwards from the interior, each terminating at right angles to the surface in one of the surface-papillæ. These are connected by a secondary set, consisting of an irregular network of much finer, uncored fibres, meeting the primary fibres at acute angles, and forming by their branching and anastomosis irregularly diamond-shaped meshes. Surface network formed by secondary fibres connected with the interior secondary-fibre network, and laterally with the apices of the primary fibres. Primary fibres cored by coarse foreign bodies, which are enveloped by pale-yellow horny matter, but which generally occupy all the fibre except a slight external film, and cause it to bulge largely at the sides; diameter from .0507 to .235 millim. in the spirit, from .038 to .0834 in the dry specimen. It should be noted with regard to this discrepancy that the foreign bodies in the latter are much smaller than in the former, and being many of them sponge-spicules, which protruded from the fibre, were not included entirely in the estimate of the diameter as given here. There is considerable irregularity as to whether the fibre is cored throughout or not in this specimen, which may be due to the reason suggested by Hyatt<sup>2</sup> for a similar fact observed in *Carteriospongia otahitica*, viz. the relatively smaller amount of accessible material for the core in the one case. Secondary fibres obscurely striated, the external laminae denser than the internal ones,

<sup>1</sup> All the characters are taken from the spirit specimen, deviations in the dry one being noticed.

<sup>2</sup> Mem. Bost. Soc. ii. pt. iv. p. 541.

sometimes giving somewhat the appearance of an *Aplysina*-fibre to it; generally with a fine dark axial line (rarely seen in the dry specimen); transparent, pale yellow; diameter .006334 to .038 millim. in the spirit, .006334 to .057 in the dry specimen.

*Parenchyma* brownish yellow, granular, subopaque in the spirit specimen; apparently represented by shreds of almost colourless transparent material, carrying small and large foreign bodies, in the dry one.

*Examined.* In spirit in the dried state, and by mounting in balsam.

*Hab.* Tom Bay (Trinidad Channel, off chief island of Madre-de-Dios archipelago), in S.W. Chili, 0-30 fathoms, on *Idmonea* (Dr. Coppinger). "Southern Seas" (*Péron et Lesueur, apud Lamarck*<sup>1</sup>).

*Obs.* Advantage has been taken of the discovery of a good spirit specimen to give the characters of the sponge in full, as Lamarck's description is insufficient.

#### Order RHAPHIDONEMATA, Carter.

##### CHALINA COPPINGERI, sp. n. (Plate X. fig. 2.)

Sponge suboval, slightly compressed; sessile by elongate base. Colour bright amber-brown. Texture very elastic and soft. Surface almost smooth. A single round vent on one side, 3 millims. in diameter, penetrating deeply. Pores? Skeleton Chalinoid, very regular. Main primary fibres running at right angles to surface, from which they project by sharp points by .088 to .32 millim., spiculated throughout with two or three series of axially placed spicules; diameter of fibre .07 to .089 millim. Secondary fibres at right angles to the preceding, and of about the same diameter; spicula 1-serial; both kinds of a pale amber-colour, very distinctly laminated. A young, intermediate series of fibres, parallel to each of the preceding, occupies the wide spaces which exist between them, containing one series of spicula; diameter of fibre .006334 to .03167 millim. Dermal skeleton of same general structure as main skeleton, the intermediate fibres form smaller and less regular meshes. Spicules slender, smooth, acerate, straight or slightly curved, tapering to sharp points from near to the ends, average maximum size .1013 by .0025 millim.; sarcode transparent, almost colourless, with scattered spicula.

*Examined.* In spirit and by mounting in balsam.

*Hab.* Victoria Bank<sup>2</sup>, off S.E. Brazil, 39 fathoms; growing on an erect calcareous Polyzoon. One specimen.

*Obs.* This Sponge is of the shape, and about two thirds the size, of a hazel-nut; it has lost most of its sarcode, but is otherwise well preserved. The MS. species *C. argus*, Schmidt, from Florida, resembles it very closely in microscopic characters; but the fibre is

<sup>1</sup> *Loc. cit. suprâ.*

<sup>2</sup> This bank is not marked in the ordinary maps; its position is lat. 20° 42' S., long. 37° 27' W.



generally less thick than in our species. When the external characters of this Sponge are known, it may perhaps prove to be identical with our species.

Of several Sponges which have almost identically the same spicule may be mentioned:—*Spongia arborescens*, Lamarck, said to inhabit the "seas of America;" *Chalina limbata*, Bowerbank (Montagu?), and *C. gracilentia*, Bowerbank, Britain. The latter is probably the nearest-allied species which has been described, but differs in having the spicules much more numerous in the fibres, in having a less elaborate intermediate set of fibres, in the slightly inferior length (about .08 millim.) of the spicules, and the coating habit of growth.

The specific name has been given to it in honour of the discoverer, Dr. R. W. Coppinger, who has, by the richness in species of this valuable collection, and by the good condition in which he has sent the specimens, made so important an addition to our knowledge of the Sponge-fauna of a region in which it has been hitherto almost entirely uninvestigated.

*SIPHONOCALINA FORTIS*, sp. n. (Plate X. fig. 3.)

Erect, tubular. Tube dilated in some parts. Mouth single, unfringed. Main skeleton composed of a set of primary horny fibres radiating from inner to outer surface, projecting from the latter by short points, diameter from .14 to .25 millim.; and of a secondary set at right angles to the former, diameter from .07 to .14 millim.; both sets amber-brown in colour. Primary fibres cored by an axial series of proper spicules, 3 to 5 spicules broad, often somewhat scattered; secondary fibres cored by an axial series of proper spicules, 1 to 2 spicules in breadth. Dermal skeleton composed of a rectangular network of pale-brown fibre from .0095 to .025 millim. in diameter, extending between points of primary fibres, generally cored by 1 to 2 series of spicules. Parenchyma transparent, almost colourless. Spicules of one kind in skeleton and flesh, viz. smooth acerate, tapering to sharp points from about  $2\frac{1}{2}$  diameters from the ends; size .07284 by .00739 millim.

*Examined.* Dry and by mounting in balsam.

*External Characters.* The single specimen consists of a tube which has been torn from a larger mass, and might well, when perfect, have had the general form of the specimen figured<sup>1</sup> as *Callyspongia bullata* by Duchassaing de Fontbressin and G. Michelotti, and referred by Schmidt<sup>2</sup>, with great probability, to a species of *Siphonochalina*. The tube is 40 millims. in height, 17 millims. at its greatest, 11 millims. at its smallest diameter; it has somewhat the outline of an hour-glass, being constricted to 11 millims. at about 10 millims. from the mouth; it is circular, with walls varying from 1 to 4 millims. thick. It has lost most of its sarcode and much of its dermal skeleton. The edge of the mouth is level all round, and shows no trace of a fringe of projecting fibres.

*Vents.* These are probably represented by the single mouth.

<sup>1</sup> Spong. Mer. Caraib., pl. x, fig. 5.

<sup>2</sup> Spong. atl. Geb. p. 33.

*Pores.* The dermis is not sufficiently well preserved to show them.

*Hab.* Portland Bay, Chili (in the channel between the chief island of the Madre-de-Dios archipelago and the mainland), 10 fathoms.

*Obs.* The nearest identifiable ally of this Sponge appears to be that described by Schmidt<sup>1</sup> as *Siphonochalina bullata*, which, as already observed, it probably resembled closely in external characters. It is not certain that that Sponge is identical with the *Callyspongia bullata* of Duchassaing de Fontbressin and Michelotti; and it certainly is not the *Spongia bullata* of Lamarek, which those authors consider their Sponge to be. The chief distinguishing characters of the two Sponges are as follows:—

	<i>External Characters.</i>	<i>Main Skeleton.</i>	<i>Spicules.</i>
<i>Siphonochalina fortis</i> (Chili).	Form tubular, perhaps rising from an enlarged base.	Network open. Two sets of fibres regularly arranged at right angles; fibres from .07 to .25 mm. in diameter.	Acerate, tapering abruptly. Size .07284 by .0070 millim.
<i>S. bullata</i> , Schmidt (?Duch. et Mich., non Lamk.), (West Indies).	Several tubes rising from one base.	Network close. Two sets of fibres regularly arranged at right angles; fibres from .0355 to .1065 mm. in diameter.	Acerate, tapering abruptly, size .076 by .025337.

CLADOCHALINA ARMIGERA, Schmidt (non Duch. de Fontbressin et Michelotti), var. PERGAMENTACEA, nov. (Plate X. fig. 4.)

*Cladochalina armigera*, O. Schmidt, Spong. atl. Geb. p. 35.

A fine dried specimen appears to represent this species, although it shows some important differences from it.

*External Characters.* Suberect, elongated, flattened from side to side, the long diameter being about three times as great as the short diameter; the upper of the two edges bears most of the vents. It is curiously bent to form an angle of 60° at about its middle, so that the apex nearly touches the rock on which it stands. Surface even except near the vents, and smooth, though finely striated by a subdermal and a dermal network of coarser and finer fibres respectively. Colour pale brown. *Vents* subcircular, long diameter from 1.5 to 3 millims., occurring at intervals of 8 to 15 millims. along the edges of the Sponge; they stand out on small rounded eminences to a height of about 1 millim. from the surface, and end in a reticulated bottom at from 2 to 4 millims. below the edge. *Pores*?

*Main Skeleton.* Composed of a vertical ("deep") set of strong horny fibres, of .04434 millim. average diameter, coming from the centre, giving off numerous smaller branches laterally, and meeting at right angles a stout ("subdermal") set of fibres, diameter .056 to .14 millim., which run along parallel with the surface, branching and anastomosing so as to form the coarser meshes of the surface, and have a tetra- to polygonal outline. The subdermal network forms

<sup>1</sup> Spong. atl. Geb. p. 33.

an external framework, which is the main agent in giving the Sponge its firmness. Arising from this subdermal network, and generally closely enveloping it, is a much finer ("dermal") network or veil (corresponding in relations to the veil on which Schmidt based his genus *Ditela*, afterwards reunited to *Spongia*); its fibres are derived from the upper surface of the subdermal fibres by smaller branches, which branching out horizontally become much finer; the finest form the finer part of the network, of which the coarser form the supporting ribs; the diameter varies from .02534 millim. for the coarsest to .00475 millim. for the finest fibres. The "veil," however, at the free end and at the lower edge of the Sponge projects beyond it as a loose envelope. The fibres are very transparent, of a pale amber-colour of various shades, and are delicately laminated. The vertical and smaller subdermal fibres are cored by a uniserial row of fine acerate spicules, placed end to end. In the freely projecting parts of the veil the stouter dermal fibres may be cored by spicules quinquieserially arranged; the finer dermal fibres are cored by uniserial acerates, although these are often wanting for considerable tracts, or only present at intervals. *Parenchyma* transparent. The spicules apparently sometimes occur singly or in groups in the stout subdermal fibres; possibly others have been present and been absorbed. *Skeleton-spicules* smooth, fine, acerate, tapering somewhat gradually to sharp points, nearly straight; size .076 by .001267 millim.; many of them have undergone more or less absorption. *Flesh-spicules* same as of skeleton.

*Examined.* In the dried state and by mounting in balsam.

*Hab.* Hotspur Bank, off east coast of Brazil (lat. 17° 32' S., long. 35° 46' W.), 35 fathoms, on piece of calcareous rock.

*Obs.* As Schmidt's account is very short, and as the specimen is well preserved, the characters of the Sponge are given fully. The chief differences between this specimen and Schmidt's appear to be:—(1) the *superficial* (not axial) position in the stout subdermal fibre of the spicules in the former; (2) the inferior diameter of that fibre as compared with the present specimen (being as 3 to 5); (3) the branching of Schmidt's specimen, and (4) its bearing (as appears from his referring to Duch. de Fontbressin and Michelotti's species) small spinous processes on its surface; and (5), lastly, the superior proportions of the spicules of Schmidt's specimen, which measure .0887 by .00211 millim. These differences justify the separation of this form at least as a well-marked variety, although our acquaintance with the Chalinidæ appears to be too limited and their characters too few to admit of distinguishing it as a species at present. Attention is particularly called to the beauty and complexity of the arrangement of the skeleton.

The above differences may be thus tabulated:—

	<i>External Characters.</i>	<i>Skeleton.</i>	<i>Spicules.</i>
<i>Cladochalina armigera</i> , Schmidt (Florida and Antilles).	Erect, branched; surface covered with spines; vents scattered, 3 millims. in diameter.	Stoutest fibre superficially cored by spicules; its maximum diameter about .884 millim.	Size .0887 by .00211 millim.
<i>C. armigera</i> , var. <i>pergamentacea</i> (Atlantic, off East Brazil).	Suberect, unbranched; surface smooth, only rendered uneven by the two series of vents, 2 to 3 millims. in diameter.	Stoutest fibre sometimes cored, axially, by spicules; maximum diameter .14 millim.	Size .076 by .001207 millim.

### Order ECHINONEMATATA, Carter.

#### PHAKELLIA EGREGIA, sp. n. (Plate X. fig. 6.)

Form erect, stipitate, ramose; bases of branches flattened, ends rounded. Surface hirsute, owing to freedom of echinating columns from the axial skeleton for from .7 to 1.25 millim. of their length. Colour (in spirit) yellowish white. Skeleton-axis typically Axinellid, diameter about the same as the length of an echinating column; longitudinal lines from .18 to .25 millim. apart, multispicular, compact. Echinating columns very distinct, connected with each other for about one third of their length by horizontal bars of single spicules, and strongly echinated from their bases upwards. Parenchyma very pale yellow, slightly granular.

Skeleton-spicules of four kinds, viz.:—(1) Setaceous acute, smooth, slightly curved, tapering to sharp point, very frequently swollen near its base, size 1.207 by .01268 millim., springing from axis and lying between echinating columns. (2) Stouter, smooth, slightly curved acute, tapering to less sharp point, size either .8875 by .019 millim. from within echinating columns, or .38 by .07416 when echinating the columns. (3) Smooth acute, sharply bent at about one fourth of its length from the base, tapering to sharp point, size .2534 by .0095 millim., forming the bulk of the echinating and axial meshwork spicules. (4) Smooth acerate, sharply bent, tapering to sharp points, size .304 by .01267 millim., forming part of the horizontal or cross series of spicules, which lie between the echinating columns and between the axial columns, not abundant. No flesh-spicules.

*Examined.* In spirit and by mounting in balsam.

*External Characters.* It is about 65 millims. high, and has a short pedicel rising from a slight basal expansion. The branches lie approximately in one plane. It is firm in texture, owing to its well-developed axis. The sarcodite invests all but from .5 to .8 millim. of the ends of the echinating columns. No oscula or pores were made out. *Skeleton* very regular. The echinating spicules project in great numbers from the columns at the usual acute angle. *Spicules.* The thick long acuates apparently form the backbone of the echinating columns, though they are not always to be made out: the shorter ones, of nearly the same breadth, occur in small numbers among the smaller echinating spicules. The small number of acerates present may be due to the youth of the specimen; they are to be made

out, however, in almost every piece examined, and are well preserved and constant in their positions.

*Hab.* Sandy Point, 7-10 fathoms (on a piece of shell).

This specimen is finely preserved and is probably young.

*Obs.* The formation of the axial network mainly by short acuate spicules, and echination of the axial column by isolated long acuates in addition to the diverging columns, distinguish, at any rate by the perfection to which they are here carried out, this species from all the species which have been assigned to either of the closely allied genera *Phakellia* and *Dictyocylindrus*. The absence of cylindrical spicules differentiates it from *P. ventilabrum* and *P. folium*, Sdt., but can hardly be said to ally it very closely to the other two species, *P. robusta* and *P. tenax*, which are similarly circumstanced; for in the one the long isolated acuates are wanting, and in the other a small *spined* cylindrical echinates the fibres. The long acuate occurs, however, in many other Axinellida. Probably *Axinella cinnamomea*, Sdt., from the Adriatic and Algiers, is the species most closely allied to ours, of known forms—though the short acuate is scarcely bent at all as it is here, and it wants the very stout long and short acuates which seem to connect this species with the Atlantic species *A. mactophora*, where these assume such a striking size.

Some of the chief differences between *P. cinnamomea*, Sdt., and this Sponge may be thus stated:—

	<i>Acuate Spicules.</i>	<i>Shorter Slender Acuate.</i>	<i>Stout Acuate.</i>
<i>Axinella cinnamomea</i> , Sdt. (Adriatic and Algiers).	Sharply bent, tapering gradually. Size $\cdot 444$ by $\cdot 01267$ millim.	Very scarce; possibly not proper to sponge; slightly bent. Size $\cdot 2837$ to $\cdot 3863$ by $\cdot 01086$ to $\cdot 01267$ millim.	Wanting.
<i>Phakellia egregia</i> (Straits of Magellan).	As in preceding. Size $\cdot 304$ by $\cdot 01267$ mm.	Very abundant; sharply bent. Size $\cdot 2534$ by $\cdot 0095$ millim.	Two sizes occur.

#### Order HOLORRHAPHIDOTA, Carter.

##### CIOCALYPTA CALVA, sp. n. (Plate X. fig. 7.)

**Massive.** Surface smooth. Structure of Sponge cavernous. Colour whitish. Skeleton of widely separate spiculo-fibres rising from base, where they are contorted and form a layer. Fibres stout, flattened, multispicular, spicules parallel in them; at base containing a margin of sarcode of one fourth of diameter of fibre, superiorly becoming approximately Holorrhaphidote; beginning to branch and anastomose about halfway between base and dermis, ending in dermal membrane in tufts of slightly diverging spicules, which spread on the membrane without meeting neighbouring tufts. Dermis otherwise naked, subopaque, thin, fragile. Skeleton-spicule acuate, slightly bent, tapering from head to a sharp point, size  $\cdot 577$  by  $\cdot 01267$  millim. No flesh-spicule.

*Examined.* In spirit and by mounting in balsam.

*External Characters.* Sessile, forming a beehive-shaped mass about 18 millims. deep by about 50 millims. long and 36 broad, growing on the surface of a large flexible worm-tube. Surface curved both actually and relatively to its base, so that the thickness of the Sponge at the edges is almost nil. Surface slightly irregular, owing to depressions between the ends of the skeleton-fibres, covered externally by a dirty-white dermis of the same colour as the fibres. Surface of dermis smooth.

*Vents?* Pores apparently represented by oval openings, from .633 to .16 millim. in diameter, occurring in groups.

Fibre resembling that of *Desmacidon fruticosum*, Johnston, in amount of soft material, except at base, where the spicules lying in the centre occupy only about half the diameter of the fibre, and give it a strongly Chalinoid appearance. Spicules lying parallel in the fibre, projecting from it only at the dermis. Soft material of fibre granular, yellowish, subopaque, not resembling ordinary horny fibre. Number of spicules in diameter of fibre varies from about 15 millims. in larger to 3 or 4 in small lateral fibres.

*Parenchyma.* Yellowish white, granular, adhering to fibres.

*Dermal Membrane.* Yellowish white, granular, in some parts possessing muscular or other fibres, apparently arising from beneath it.

*Skeleton-spicule.* Of one kind, acuate, slightly bent, tapering gradually from a well-rounded head to a sharp point. Size .577 by .01267 millim.

*Flesh-spicule.* None.

*Hab.* Sandy Point, 7-10 fathoms; on large worm-tube.

*Obs.* The strongly ceratinous character of the base of the fibres, the absence of fistulæ, and the absence of dense spicular axes from which the fibres should radiate, all tend at first sight to separate this species from the genus *Ciocalypta*, and, in fact, exclude it from that genus, if we limit it to forms included by Dr. Bowerbank's diagnosis; but the general structure of the fibre and the mode of termination of its outer extremity, together with the general agreement in the form of the spicules, ally it too closely to *C. penicillus* and *C. leei* to allow of a distinct generic appellation at this time, especially as the method of growth suggests that it may be merely a young or sessile form of a species closely allied to *C. leei*. The proportions of the skeleton-acuates are:—

<i>C. penicillus</i> , Bowerbank.	Britain.	.6035 by .02058 millim.
<i>C. leei</i> , Bowerbank.	Britain.	.57 „ .019 „
<i>C. calva</i> ,	Magellan.	.577 „ .01267 „

*C. tuberculata*<sup>1</sup>, Carter, is closely allied to these, but has a skeleton-spicule .023223 millim. in diameter.

The specimen is remarkable for containing in its dermis a number of spicules belonging to *Eesperia magellanica*<sup>2</sup>.

<sup>1</sup> Ann. & Mag. Nat. Hist. ser. 4, xviii. p. 235.

<sup>2</sup> Cf. Journ. Linn. Soc. (Zool.), xv. p. 149.

*ESPERIA MAGELLANICA*, sp. n. (Plate X. fig. 5.)

Massive, subcylindrical. Surface and interior coloured by cells containing a dark pigment. Dermis fragile, with a coarse skeletal network. Main skeleton composed of a central irregular compact meshwork, which sends ramifying and anastomosing fibres to the dermis. Fibres of main and dermal skeleton stout, composed of parallel spicula with a minimum of sarcode. Skeleton-spicules of one form only, viz. spinulate, with a very slightly marked oval head; length  $\cdot 4615$  to  $\cdot 544$  millim., breadth  $\cdot 01267$  millim. Parenchyma pale yellow to ochreous brown when dry, dirty white in spirit. Flesh-spicules of two forms, viz.:—(i.) inequianchorate with the large palm about  $\frac{2}{3}$  of the total length of the spicule, and its lower angles turned upwards and inwards, length  $\cdot 0444$  to  $\cdot 05384$  millim., scattered; and (ii.) minute acerate, generally in bundles of two to four, sharply pointed, length  $\cdot 0444$  to  $\cdot 0634$ , breadth about  $\cdot 001055$  millim., scarce.

*Examined.* In spirit, in dried state, and mounted in balsam.

*External Characters*<sup>1</sup>. Form irregularly cylindrical, rounded off rapidly below to a narrow base of attachment, and provided above with a slight neck at about 30 millims. from the superior extremity, where it is also rounded off. Below the neck the greatest diameter is about 60 millims., above it about 45 millims.; total length 120 millims. Colour in life very variable, yellow or green; in spirit grey, or dirty-white (in the dried specimens ranging from yellowish white to an ochreous brown). Surface entirely covered with mammi-form papillæ, from 3 to 6 millims. in greatest diameter, often coalescing into ridges; provided at the superior extremity with two circular vent-openings, respectively 7 and 8 millims. in diameter, probably much larger in life. Texture delicate, very readily compressible. *Pores*?

*Minute Structure of Surface.* Surface covered by a fragile dermis, of the thickness and texture (when wet) of blotting-paper, composed of a single layer of more or less loose spiculo-fibre, with polygonal meshes from  $\cdot 25$  to  $\cdot 5$  millim. in diameter, tympanized by a very pale brown sarcode more or less interspersed with loose spicules and greenish-brown granular cells, sometimes having the centre occupied by a dark patch of pigment.

The minute acerates occur in bundles of two to four, occasionally scattered; they are straight and sharply pointed at both ends. They are found at the sides of the dermal and main skeleton-fibres. They are of scarce occurrence; and for that reason and from the need of an exceptionally good light for finding them, they constitute an inconvenient character for reference. Probably they invariably occur in the place of tricurvates in *Esperia*, where these are absent.

*Hab.* Sandy Point, 7–10 fathoms; bottom, dead *Balani*, some of which are still, together with a good-sized *Terebratulæ*, embedded in its base.

Seven dry specimens from Otter Island, Patagonia, representing

<sup>1</sup> These refer to the spirit specimen, except where otherwise stated.

three specimens, were already in the Museum collection, and are evidently pieces of those mentioned by Dr. Cunningham at p. 481 of his 'Notes on the Natural History of the Strait of Magellan.' The following are their chief characters, arranged for comparison with those of the type specimen. It cannot, unfortunately, be determined *which* pieces formed part of the same original specimens:—

	Subspinulate spicule.	Inequianchorate spicule.	Bundles of Acerates.	Other characters.
No. 1 .....	Shape as in type; .497 mm. long by .01267.	Shape as in type; .04434 mm. long.	Scarce; .057 mm. long.	Surface <i>ridged</i> rather than papillose.
No. 2 .....	Ditto .....	Shape as in type; .05384 mm. long.	(Curved, very scarce; .07842 mm. long?)	Surface do.
No. 3 .....	Ditto .....	Shape as in type; .04434 mm. long.	?	Surface do.; vents?
No. 4 .....	Shape as in type; .4615 mm. by .01267.	Shape as in type; .05067 mm. long.	Very scarce, generally scattered; .06334 mm. long.	Surface papillose in one part, ridged in another.
No. 5 (most of surface gone).	As in No. 1 .....	As in No. 1 .....	Very scarce; .042339 mm. long.	Surface the same; a large internal cavity. Apparently 2 vents.
No. 6 .....	Shape as in type; .488 mm. by .01267.	Shape as in type; .047506 mm. long.	Very scarce; .044339 mm. long.	Surface ridged. Vents 3?
No. 7 .....	As in No. 1 .....	Shape as in type; .05067 mm. long.	Ditto.	Surface ridged and papillose. Vents 2?
Type specimen from Sandy Pt.	.544 by .01267 mm.	.0475 mm. long.	Scarce; .057 mm. long.	Surface mostly papillose. Vents 2.

All possess an abundance of the characteristic dark pigment, but concentrated at the centres of well-defined cells, whereas in the spirit specimen from Magellan's Straits it is generally, though not always, scattered over the cells.

It is very probable that the wrinkled or ridged character presented by the dermis of most of the dried specimens is due to the fact of their having been dried. In all cases except that of the extraordinarily broad specimen No. 6, the external characters of shape, surface-reticulation, and colour agree very closely in all the dried specimens, and must be almost, if not quite, identical with those which would be presented by the spirit specimen if it were dried.

*Obs.* This Sponge belongs to the section of *Esperia* which is devoid of bihamate flesh-spicules. It is to be wished that a distinct genus were formed for the reception of the numerous forms which belong to it. Possibly *Rhaphidotheca*, Kent, may ultimately be found to satisfy the requirements of the case (*cf.* Mr. Carter's remarks in the Journ. Roy. Micr. Soc. ii. p. 498); but until the questions which are suggested by the description of the type species



of that genus are settled, it will be well to adhere to the more comprehensive term *Esperia* for these forms.

The nearest allies of this Sponge, of which intelligible descriptions or specimens are available, appear to be:—

	<i>Spinulate spicule.</i>	<i>Inequi- anchorate.</i>	<i>Acetates.</i>
<i>Esperia nodosa</i> , Schmidt, } Adr. Meer. Suppl. i. p. 33 } (Adriatic).	.4117 by .011085 mm.	.0577 mm.	.057 mm.
<i>E. bowerbanki</i> , id. Adr. } Meer. p. 55 (Adriatic)... } <i>E. tunicata</i> , id. ibid. (Adri- atic) .....	About same as preceding. .399 by .0095 mm.	.06334 mm. . .05384 mm.	Ditto. . .0475 mm.

*E. rhopalophora* and *E. intermedia*, Schmidt, from the North Atlantic, may perhaps prove, when more fully described, to come near this species. *Rhaphidotheca affinis*, Carter, from off the north of Scotland, differs but slightly from it in the forms of its spicules; but their sizes are greater.

For details of appearance in life see Dr. Cunningham's work on the Straits of Magellan above mentioned.

#### ALEBION PROXIMUM, sp. n. (Plate X. fig. 8.)

Incrusting. Surface covered with numerous narrow convolutions, and minutely roughened; vents scattered, .2 to .3 millim. in diameter. Colour dark brown. Main skeleton composed of primary columns of spiculo-fibre running from base towards surface; fibres 5 to 6 spicules thick, crossed by secondary bars approximately at right angles, bars 2 to 5 spicules thick. Dermal skeleton a regular polygonal network of spiculo-fibre, 1 to 5 spicules thick, beneath which lie irregular tracts of cylindrical spicules. Spicules united in fibres by a minimum of sarcod. Parenchyma very granular, reddish brown. Skeleton-spicules of two kinds:—(i) acute, covered from base to apex with short spines, tapering from within about 5 diameters of apex to a sharp point, size .15835 by .0095 millim., in main and dermal skeleton; (ii) cylindrical, tapering from middle to a neck, terminated by a distinctly spined head, at each end, size .15835 by .0079 millim., in subdermal tracts. Flesh-spicules of two kinds:—(i) inequi-anchorate, upper palm conical in outline, inferior edges angulated, shaft slender, lower palm small, triangular, terminated by a sharp point, length .02534 millim., scattered; (ii.) bipocillate, exactly similar to that of the British species *Halichondria hyndmani*, Bowerbank, size .01056 millim. broad (from back of shaft to front of the curves), scattered.

*Examined.* In spirit and by mounting in balsam.

*External Characters.* This species is represented by a specimen coating one valve of a *Pecten*. It resembles *Halichondria hyndmani* and other nearly allied British forms in its corrugated surface. At the centre of the shell it is merely a brown film. The convolutions are sometimes substellately arranged, and may be as much as

2 millims. in height. *Pores?* *Vents* distant from each other by 2 to 7 diameters. Texture fragile.

*Skeleton* appears somewhat confused in transverse sections; but this is partly due to the opacity of the sarcode, which conceals in part the relations of the fibres. Spicules aggregated loosely in fibres. The colour of the *parenchyma* resembles that of most *Microcionæ* and most of the British *Halichondriæ* (Bowerbank) which are related to this species.

*Skeleton-spicules.* The heads of the cylindricals are well marked, being nearly as broad as the maximum diameter of the shaft; their external halves are covered with small but distinct spines. The whole spicule presents an exaggerated form of the corresponding type in *H. pattersoni*, *H. hyndmani*, and *H. ingalli* (in which species its head is faintly microspined). *Flesh-spicules.* The inequianchorate is of the same form, down to the inferior spine of the small palm, as in the above-named species, as is the bipocillate ("bipocillated anchorate" of Bowerbank, "grotesque spicule" of Carter). The latter, which was very seldom found in the microscopic mountings, is decidedly larger than in any of the British allied species. For further relations to these forms, see table of comparison (*infra*) with the type specimens of Bowerbank's species.

*Hab.* Sandy Point, 7-10 fathoms (on a *Pecten*).

#### Spicules—Characters and Proportions.

	Spined Acuate.	Cylindrical.	Inequi- anchorate.	Bipocillate.
<i>Alelion</i> ? <i>proximum</i> (Straits of Magellan).	Slightly spined all over; tapering from near apex; .15835 by .0095 mm.	With distinct heads; .15835 by .0079 mm.	As in British species. .025337 mm. long.	As in British species. .01056 mm. broad.
<i>A. (Halichondria) pattersoni</i> , Bowk. (Britain).	Slightly spined all over; tapering from near middle; .23436 by .010537.	Heads scarcely distinguishable from shaft; .247 by .006334.	.025337 long.	About .008 mm. broad.
<i>A. (H.) hyndmani</i> , Bowk. (Britain).	Spines mostly near base; tapering from middle; .228 by .0095.	Very slight, faintly spined heads; .19636 by .038.	.02275 long.	.008445 mm. broad.
<i>A. (H.) ingalli</i> , Bowk. (Britain).	Spines mostly near base; tapering from middle; .152 by .006334.	Heads less visible and less spined than in preceding; .1457 by .02534.	.01583 long.	.008445 mm. broad.

*Alelion*, Gray (P. Z. S. 1867, p. 534) seems to be the only genus at all correctly defined, of the four in which he has placed these and the allied species; the character of "branching" should, however, be omitted from it.

Probably *Myxilla rubiginosa*, Sdt., from the Adriatic, is allied to these forms; but Schmidt does not mention any minute flesh-spicules from it.

## HYMEDESMIA POLITA, sp. n. (Plate X. fig. 9.)

Incrusting, thin. Surface glabrous, with minute scattered points, dark umber-brown. Vents chiefly grouped two or three together, minute. Pores scattered. Main skeleton of short primary spicular columns extending directly from base to surface, which break into a slight brush just below surface, and slightly project from it; bases surrounded by groups of small spined acuate spicules. Dermal skeleton of a thin loose spiculo-fibre connecting the primary columns. Sarcoderm reddish brown. Main skeleton-spicules of two kinds:—(i) Spined acuate, spines reaching to within one fourth of length of the sharp apex, most strongly developed at base, size  $\cdot 25337$  by  $\cdot 00887$  millim.; (ii) smooth acuates tapering from head almost to the apex, which is abruptly pointed, size  $\cdot 2407$  by  $\cdot 0038$  millim. Dermal skeleton-spicules same as latter. The small spined acuates are entirely spined, size  $\cdot 10135$  by  $\cdot 006334$  millim. Flesh-spicules confined to dermis, of one kind, viz. equianchorates in rosette-like groups, shaft slender, front palms entire, with a straight lower edge, tubercle prominent, length  $\cdot 01267$  millim.

*Examined.* In spirit and by mounting in balsam.

In *external characters* the single specimen is incrusting, very thin (about  $\cdot 6$  millim. greatest thickness); surface slightly uneven, glabrous, minutely punctate. Colour very dark umber-brown in spirit. *Vents* chiefly in groups of 2 or 3, oval or circular, opening obliquely to surface; diameter about  $\cdot 25$  millim. *Pores* oval, scattered, numerous, about  $\cdot 07$  millim. in greatest diameter.

*Skeleton.* No distinct basal membrane. Some lines of fine long acuates lie at the base. A set of distinct primary spicular bundles spring from the base at from  $\cdot 18$  to  $\cdot 36$  millim. apart; their bases are surrounded by groups of spined acuate spicules; they proceed to surface approximately at right angles to it; and their spicules diverge laterally, echinating the fibre until just below the surface, where they diverge slightly; the apices of the terminal spicules project beyond the surface slightly.

*Dermis.* Lines of fine long subparallel acuate spicules extend between the apices of the primary skeleton-columns, diverging from one another where the lines are bent.

*Hab.* On a *Balanus* sessile on large worm-tube. Sandy Point, 7–10 fathoms.

*Obs.* It approaches *Microciona tuberosa*, Bowerbank, from the Straits of Malacca, very closely in spiculation and some other characters.

	<i>Microciona tuberosa</i> , Bowk. (Straits of Malacca.)	<i>Hymedesmia polita</i> . (Maggellan.)
1. <i>Slender Acuate Spicule.</i>	Sometimes basally microspined very slightly. Length $\cdot 285$ mm.; breadth $\cdot 00475$ .	Always smooth. Length $\cdot 2407$ mm.; breadth $\cdot 0038$ .
2. <i>Stout Long Acuate.</i>	Only slightly uneven at base. Length $\cdot 2487$ mm.; breadth $\cdot 0095$ .	Spined for at least half of length. Length $\cdot 25337$ mm.; breadth $\cdot 00887$ .

	<i>Microciona tuberosa</i> , Bowk. (Straits of Malacca.)	<i>Hymedesmia polita</i> . (Maggellan.)
3. <i>Small Spined Acuate</i> .	Spined all over. Length .1077 mm.; breadth .0079.	Spined all over. Length .10135 mm.; breadth .006334.
4. <i>Equianchorate</i> .	Same characters in both.	
<i>Habit</i> .....	Very thinly incrusting?, sending out at intervals ciliated columns about .34 mm. long.	Incrusting. Reclining columns buried in sarcode, with the exception of terminal spicule-points.
<i>Dermis</i> .....	Externally ciliated by small spined acuates; sarcode dark, not constantly spicular.	Smooth, except at points of projection of skeleton-bundles; slightly but constantly spicular.
<i>Sarcode</i> .....	Granular, reddish brown.	Granular, reddish brown.

This appears to be its nearest described ally; but it is placed with *Hymedesmia* provisionally (in spite of its wanting the bihamate spicule found in the type, *H. zetlandica*) in preference to *Myxilla* and *Microciona*, owing to its fundamental divergence in spiculation from the type species of those genera.

(Note. Any discrepancies between this account of *M. tuberosa* and that given by Dr. Bowerbank in his description in Proc. Zool. Soc. 1875, p. 281, are justified by an examination of the type specimen. The "somewhat complicated rete," said to be formed by the "skeleton-columns" (*l. c.*) appears to be not due to the sponge-skeleton, but to an anastomosing mass of tubes formed probably by an arenaceous foraminifer; for the axis of the "columns" is, as a rule, not spicular, but formed of minute grains of sand.)

### TRACHYTEDANIA<sup>1</sup>, n. gen.

*Sponge*. Main skeleton composed of vertical inferiorly distinct spiculo-fibres, terminating on surface in radiating brushes; spicula siliceous, united by a minimum of sarcode, lying parallel in fibre, of three forms, viz. spined acuate, smooth acuate, terminally or subterminally inflated cylindricals. Flesh-spicules siliceous, slender, acerate. Sarcode pale-coloured. A basal lamina of spicules may be present.

This genus is based on the new species *T. spinata*. It differs from all the known species of *Tedania*, Gray, in having three kinds of skeleton-spicules, one of them being spined; that genus, however, seems to be the nearest genus at present defined.

#### TRACHYTEDANIA SPINATA, sp. n. (Plate X. fig. 10.)

Incrusting, laminar. Surface level, glabrous; under lens seen to be minutely but thickly pitted. Colour yellowish white. Vents? Pores? Main skeleton a series of independent, approximately vertical spiculo-fibres, about 3 to 6 spicules thick, rising from a basal lamina of fine cylindrical spicules, and deflected laterally at surface, there breaking up into a horizontal brush of somewhat radiating cylin-

<sup>1</sup> From *τραχὺς*, rough, in allusion to the *spined* basal spicules, and *Tedania*, the name of the allied genus.

dricul spicules, which, with loose ones of the same kind, form the dermal skeleton by the crossing of their ends. Main fibre, spicules united somewhat loosely. Parenchyma compact, almost perfectly colourless and transparent. Skeleton-spicules of three kinds, viz.:— (i) acuate, covered with sparse, short spines for about 4 diameters, from base, tapering to point gradually, size  $\cdot 1647$  by  $\cdot 006334$  millim., forming basal portion of vertical fibres; (ii) acuate, smooth, head almost pointed, apex generally somewhat abruptly pointed, size  $\cdot 196$  by  $006334$  millim., forming median portion of vertical fibre; (iii) cylindrical, smooth, of mainly uniform diameter throughout up to the heads, which are slightly swollen, and then end in more or less sharp hastate points, size  $\cdot 1774$  to  $\cdot 18736$  by  $\cdot 0038$  millim., forming basal and dermal skeleton and summit of vertical fibres. Flesh-spicules, besides the last-named, fine acuates, very slightly blunted at base, tapering to very fine apex; size  $\cdot 152$  by  $\cdot 0009$  millim.; scattered universally through sarcodæ.

*Examined.* In spirit and by mounting in balsam.

*External Characters.* The single specimen, which is extremely well preserved, coats the valves of a *Pecten*, which was alive when taken. It forms a thin film, varying in thickness from about  $\cdot 70$  millim. to tissue-paper thickness. It fills up the depressions between the ribs, and thus presents a very smooth rounded contour; but the lens shows that it is covered with minute points and shallow pits, the former probably representing the terminations of the primary skeleton-columns. *Vents* are possibly represented by two or three irregular depressions or openings,  $\cdot 25$  to  $\cdot 5$  millim. in diameter, near the thickest part of the sponge. *Pores* not found.

The *skeleton* is simple in structure, and represents the type assigned to *Hymedesmia* by Dr. Bowerbank. The basal lamina is composed of loosely aggregated spicules, about 3 or 4 spicules thick. The composite structure of the vertical fibre is remarkable, and well adapted to secure, by the spination of the basal spicules, solidity of rooting, and, by its shading off into less stout spicules above, pliability. No special cementing sarcodæ is apparent. The structure of the dermal skeleton is essentially that of the *Tedaniæ*, though its connexion with the main skeleton is more marked than is usual in that genus. The parenchyma is slightly yellow, but in the almost entire absence of colour and of opacity resembles that of the *Renieridæ* in general. The two larger *skeleton-spicules* (acuates) are probably varieties of one original type; from its position, at the base of the column with the roughened end downwards, the spined acuate is perhaps developed to suit the incrusting form of the Sponge; otherwise it differs from the smooth form mainly in being slightly shorter. The cylindricals are really sharply pointed; but the penultimate swelling is generally discernible, and sometimes gives a fine spear-head outline to the head; they seem to be a further development of the typical cylindrical form in the same direction as that shown by *Tedania tenuicapitata* (sp. n.).

*Hab.* Portland Bay, Chili (opposite the chief island of Madre-de-Dios Archipelago), 10 fathoms. On both valves of small *Pecten*.

*TEDANIA TENUICAPITATA*, sp. n. (Plate XI. fig. 1.)

Massive, almost white. Surface bearing scattered shallow pits from about  $\cdot 17$  to 1 millim. in diameter. Texture very soft and fragile. Vents small, scattered. Pores scattered. Main skeleton a very loose network of spicules, with triangular to polygonal meshes, extending from base to surface, crossed at nodes by spiculo-fibres lying parallel to surface; sides of meshes formed by groups of 2 to 5 acute spicules (sometimes of cylindrical spicules in whole or in part), scarcely touching. Dermal skeleton composed of sheaves of 20 or more cylindrical spicules, closely aggregated at one end, and radiating outwards with the other over the surface. Parenchyma very pale yellow to colourless, finely granular. Skeleton-spicules of two kinds, viz.:—(i) smooth curved acute, tapering to a sharp point from a distance of about 6 diameters from the point, size  $\cdot 38$  by  $\cdot 01267$  millim.; and (ii) cylindrical, double-headed, smooth, heads about one third as broad again as shaft, and oval, drawn out to a point, occurring in main skeleton, and alone forming dermal skeleton, size  $\cdot 2787$  by  $\cdot 006334$  millim. Flesh-spicules acerate, tapering from centre to very fine points, roughened almost imperceptibly on surface, one end slightly the stouter, scattered, size  $\cdot 316$  by  $\cdot 0021114$  millim.

*Examined.* In spirit, and by mounting in balsam.

*External Characters.* The single specimen forms a small subpyramidal mass, whose four uninjured faces form rounded angles of about  $120^\circ$  with one another. It appears to have been broken from a mass sessile by a broad triangular base. Among the numerous small pits of the surface, in which many of the pores are collected, and between which the Sponge forms insignificant ridges, are distributed the five *vents* which are still left. Three of these are close to the apex; they open on the surface level, and penetrate straight into the Sponge to a depth of 3 to 8 millims., where they suddenly terminate; they are oval, and 1.5 to 2 millims. in diameter. The *pores* lie on the ridges and in the small surface-pits.

The *main skeleton* is very vague, the spicules of the fibre being hardly in contact; it consists generally of the stout acuates; but sometimes groups of 6 to 10 cylindricals take their places, or they are mixed with a few of these; a horizontal network of stout acuates occurs throughout, but is especially developed just below the dermis. The *dermal-skeleton* bundles appear to radiate from certain centres with more or less regularity.

The *parenchyma* is very transparent, and is sufficiently well preserved to show, in Canada balsam, numerous round nuclei, of about  $\cdot 0095$  millim. diameter, transparent, and nucleolated.

The cylindrical spicule differs from that of all hitherto recognized species of the genus in being terminally pointed; the heads are very slightly marked and suboval in outline, and are not microspined as in the Mediterranean and Malacca species already known. The fine acerate has, as in other species, one end stouter than the other, though very slightly so: the roughening of the surface is often imperceptible; it takes the form, as far as can be made out, of sub-spiral scratches.

*Hab.* Trinidad Channel, near Madre-de-Dios Islands, off S.W. Patagonia, 30 fathoms.

*Obs.* The two already described species, *Halichondria aspera* and *Isodictya rudis*, Bowerbank, both from the Straits of Malacca, possibly merely varieties of one species, together with *Tedania suctoria*, Schmidt, from Iceland, resemble our species in important points. It is also noteworthy that Schmidt refers (Spong. atl. Geb. p. 43) to a shapeless white specimen of a *Tedania* from Rio de Janeiro, to which he gives no name. Looking at the locality and at this description, one would not be surprised to find that it proved to be our species.

The two Malacca species have a most interesting relation to the rest; for with the terminally microspined heads of the cylindrical spicule, characteristic of the Mediterranean *Tedania*, they combine a very marked *roughening* of the fine acerate—an irregularity of the surface which is only possible to make out, in the case of *T. tenuicapitata*, with very good light, and then not always, and which is, so far as I am aware, peculiar to the acerates of this genus, being wholly distinct from spination or "microspination."

*Tedania suctoria*, Schmidt, has cylindricals with two smooth heads, as in our species; but they are not terminally pointed as here. It is probably the most nearly allied of described species. Its spicule-characters, for comparison with those of *T. tenuicapitata*, are:—

	<i>T. suctoria.</i> (Iceland.)	<i>T. tenuicapitata.</i> (S.W. Chili.)
Smooth Acuate Spicule.	tapering very gradually from head. Size .5325 by .01583 mm.	Beginning to taper about 6 diam. from end. Size .38 by .01267 mm.
Cylindrical Bicapitate..	Heads oval, rounded off terminally. Size .3357 to .38 by .003445 mm.	Heads slightly oval, pointed. Size .2787 by .006334 mm.
Fine Acerate .....	Surface-roughness generally perceptible. Size .2924 by .00285 mm.	Surface-roughness rarely perceptible with certainty. Size .316 by .002114 mm.
Skeleton .....	Main-skeleton fibres more compact. Dermal cylindricals radiate more regularly; bundles larger and less distinct than in the other species.	Skeleton-fibres as loose as possible. Dermal cylindricals in distinct bundles, radiating each from a separate point.

#### AMORPHINA sp. inc.

A minute, thin, incrusting patch on the worm-tube which bore *Alecion proximum*. It is white; and the sarcode is granular, but almost colourless; the spicules are smooth, sharply bent acerates, ending rather abruptly in points, and resembling those of *A. genetrivæ*, Schmidt, but far smaller, and massed in flattened tracts.

*Hab.* Sandy Point, 7-10 fathoms.

RENIERA FORTIOR, Schmidt? (Plate XI. fig. 3.)

*Reniera fortior?* O. Schmidt, Spong. atl. Geb. p. 40.

A poorly preserved spirit-specimen, which has lost most of the dermal membrane and much of the internal sarcodæ.

*Examined.* In spirit and by mounting in balsam.

*External Characters.* Form massive, irregular, subglobose, attached by a short pedicel about one fourth as broad as the greatest diameter of the Sponge. Texture very elastic. Colour semitransparent dirty white; surface in present state chiefly regularly and minutely hirsute.

*Minute Surface-characters.* Where the dermal membrane is present, this consists of a very thin brownish-yellow lamina, resting on the ends of the primary skeleton-columns, and formed by a skeleton network of 1- to 2-serial lines of fine acerate spicules, lying in a fine fibre, with meshes of  $1\frac{1}{2}$  to 2 spicules' lengths in width, crossing each other at acute angles, the intervals being more or less occupied by fine and stouter acerates lying in the almost transparent, slightly granular sarcodæ which fills them. Where this membrane is absent, the ends of the skeleton-columns project as fine pencils.

*Vents?* apparently represented by 4 or 5 roundish apertures, of about 1 millim. diameter each, situated on a somewhat concave lateral surface; they appear to lead directly inwards.

*Pores?* apparently scattered or aggregated in twos, oval; largest diameter .045 millim.

*Main Skeleton.* Composed, in the older parts, of Chalinoid fibre, containing only about half its bulk of horny matter; in the younger parts a margin of this material is but rarely seen to surround the spicular axis; possibly this is partly due to imperfect preservation. Colour absent, or of the faintish possible tinge of yellow. Primary fibres contain a 2- to 4-, generally 3-serial axis of moderately stout, short acerate spicula; they run from the centre to the surface, meeting the latter approximately at right angles, and are distant from each other by 2 to 4 spicule-lengths. Secondary fibres at right angles to the primaries, usually composed of a double series of identical spicules; occur at intervals of 2 to 3 spicule-lengths.

*Skeleton-spicules.* Of one form—short stout acerate, slightly and gradually bent, or with a slight angle, tapering gradually to the points; size .13935 millim. long by .0094 broad.

*Flesh- and Dermal Spicules.* Of one form—short slender acerate, slightly and gradually bent, tapering gradually to points; size of average largest .10135 millim. long by .0038 broad, in the case of the dermal, .1077 long by .006334 broad, in the case of the flesh-spicules, which latter are probably merely young skeleton-forms.

*Hab.* Elizabeth Island, Straits of Magellan (eastern portion), sandy bottom, 6 fathoms.

*Chalina granti*, Bowerbank, strongly resembles this Sponge in its chief essential characters; the main differences between the two are those of *degree* rather than of *kind*. Thus the skeleton-spicule measures .133 by .01056 millim., and is of the same type of acerate, though, as the measurements show, it is, although shorter, actually



as well as relatively stouter than in our Sponge. Outward form branching and fan-shaped. Its primary-skeleton fibres are far nearer together than here; in composition they are 1- to 2-spicular in some parts, 2- to 3-spicular in others, while 2 to 3, occasionally 4, is the proportion in the present species. The proportion of horny matter in the fibre is generally, as here, only just sufficient to bind the spicules into a pliable fibre.

The chief differences are shown in tabular form :—

	<i>Chalinula granti</i> , Bowerbank. (S. of England.)	<i>Reniera fortior</i> , Schmidt. (Antilles.)	<i>Reniera fortior</i> , Schmidt. (Magellan.)
Skeleton-spicule .....	·133 mm. by ·01056 mm.	·13788 mm. long.	·13935 mm. by ·0094 mm.
Composition of primary fibre...	1 to 3 spicules broad.		2 to 3 (occasionally 4) spicules broad.
„ „ secondary fibre..	1 spicule broad.		1 to 2 spicules broad.
Average maximum distance between primary fibres .....	·142 mm.		·284 mm.
External habit .....	Of irregularly shaped anastomosing branches, sessile.	Amorphous.	Erect, subglobose.

*R. fortior* is only known to me by its *description*, as the Museum possesses no specimen of it.

#### SCHMIDTIA AULOPORA, Schmidt, var.

*Schmidtia aulopora*, Schmidt, Spong. atl. Geb. p. 44, pl. v. fig. 8.

*Thalysias subtriangularis*, Duchassaing de Fontbressin et Michelotti?, Spong. mer Caraïb. p. 85, pl. i. fig. C., pl. xviii. fig. 1.

*Isodictya mirabilis*, Bowerbank?, P. Z. S. 1873, p. 319, pl. xxviii.

*External Characters.* A single fistula, about 40 millims. long and 19 broad at the broken base, and 12 broad at the vent-opening. It has evidently been torn off from a larger specimen, as the oblique fracture of the base of the tube shows. The walls are thickest at the base, viz. about 7 millims., and taper gradually up to the edge of the mouth, where they are of the thickness of cardboard. The whole tube tapers in breadth from base to mouth; but the internal diameter remains the same throughout. It presents a slight constriction or neck about 7 millims. below the mouth, below which point it has obscure longitudinal ridges, which become more marked as they approach the base, and are there accompanied by slight papillary eminences. Besides the large mouth or *vent*, there is a lateral opening, about 3 millims. in diameter, leading upwards into the cavity of the tube. The colour is a dark brown throughout. The surface is regularly covered with minute points, between which lie the *pores*. Texture subelastic; the *interior* of tube has a honeycombed

surface, the openings being those of the excretory canals. *Main skeleton* of spiculo-fibre, the spicules united by a minimum of sarcode, consisting of a primary set of fibres, from 6 to 10 spicules thick, at right angles to the surface, from which they project (multiplying as they approach the surface by *branching*), connected by a secondary set at right angles to them, containing usually from three to four spicules in their diameter, and by an irregular network of single spicules or bispicular fibre, crossing the interspaces at various angles.

*Dermal Skeleton.* An irregular reticulation, 1 to 6 spicules thick, lying between the points of the primary-skeleton fibres in superficial pigmented layer. *Parenchyma* semiopaque, muddy-brown in colour. *Spicules*—but one form for all parts, viz. a smooth acerate, slightly bent at the middle, ending rather gradually; size  $\cdot 17736$  by  $\cdot 00887$  millim. *Embryos*, apparently in the *planula* stage, lie embedded near the interior surface of the Sponge; they are oval; the greatest diameter varies from  $\cdot 24$  to  $\cdot 43$  millim. In one place a dense mass of about 15 occurred. As the specimen was taken on March 3rd, 1879, the sexual period is hereby fixed.

*Examined.* In spirit, and by mounting in balsam.

*Hab.* Trinidad Channel, Chili (just north of chief island of Madre-de-Dios archipelago), 30 fathoms.

*Obs.* The specimen differs somewhat from the original specimens of the species, though hardly enough for it to form a new species. The chief differences are here tabulated:—

	<i>External Characters.</i>	<i>Skeleton.</i>	<i>Spicules.</i>
<i>S. auropora</i> , West-Indian specimens (Schmidt).	Massive, sub-erect; vents along edge of column, in distinct tubes. Yellowish in dry state.	Primary <sup>1</sup> lines project slightly from surface; spicules 6- to 12-serial in them; secondary lines 5- to 7-serial.	Acerate, slightly bent at middle, tapering slowly off to points. Size $\cdot 165$ by $\cdot 00792$ mm.
<i>S. auropora</i> , var., S.W. Chili.	Massive; vents on distinct tube or tubes. Dull brown in spirit.	Primary lines project considerably from surface; spicules 6- to 10-serial; secondary lines 3- to 9-serial.	As in preceding. Size $\cdot 17736$ by $\cdot 00887$ mm.

The probable type specimen of *Isodictya mirabilis*, Bowerbank, from the "East Indies," has spicules measuring  $\cdot 1771$  by  $\cdot 0079$  millim., and agrees well (apart from the presence of the polyp-cells) with Schmidt's species in external characters, although the tendency of the vents to become elevated on separate tubes towards the base is but slightly marked. If the locality for that species is correct, the distribution is a very wide one—assuming the identity of the

<sup>1</sup> It should be noted that the specimen from which the character was taken was probably dried before being mounted; therefore the ends of the fibres had probably been rubbed.

species. The skeleton, however, is less regularly rectangular; and the primary fibres appear to project but little.

*VIOA CARTERI*, sp. n. (Plate XI. fig. 2.)

Sponge composed of irregularly ramifying vesicular masses, lining similarly shaped perforations in solid bodies. Body-wall and membranes thin, carrying felted or fasciculated aggregations of the skeleton-spicule. Vents scattered, papillary. Colour (in spirit) vivid crimson. Skeleton-spicule smooth, stout, spinulate, slightly curved, tapering to point; head spherical, exceeding the body in diameter; length  $\cdot 394$  millim., breadth of body  $\cdot 0152$  millim. Flesh-spicules scattered, numerous, spiro-spinular (*i. e.* elongated, spiral, spined), the curves deep, alternately angular and convex; spines long and slender; length  $\cdot 0412$  millim., breadth (without spines)  $\cdot 00127$  millim.

*Examined.* In spirit, and by mounting in balsam.

*Hab.* Victoria Bank, off S. Brazil, lat.  $20^{\circ} 42' S.$ , long.  $37^{\circ} 27' W.$ , calcareous rock, nullipore (?) &c.; bottom, dead coral; 39 fathoms.

One specimen (or possibly more in the single mass of rock) represents this species in the collection, spreading in the interior of a flattish, irregularly excavated, calcareous mass, and appearing in section at the broken edge of the mass, as well as indicating its presence by its various vents scattered over the surface; at these points a dark-crimson central spot is seen, surrounded by a fainter colour, apparently the result of the staining of the surrounding rock by the Sponge.

*External Form and Characters.* To the above may be added that it forms botryoidal irregular deep-lying masses, which ramify irregularly to the exterior, by sending out long narrowing tubes which end on the surface in the vents.

*Obs.* The coloration of this sponge is exactly the same as that of dry specimens of *Vioa johnstoni*, Schmidt, or, rather, of the form wrongly described under that name in 1870 by Schmidt (Atl. Geb. p. 5, pl. vi. fig. 18), in which sponge, as in this, the tint is not permanently altered by the action of potash; it is almost identical with that of a reputed specimen of *Alcyonium purpureum*, Lamk., in the national collection referred to by Mr. Carter (Ann. & Mag. N. H. [4] xvi. p. 197).

The generic name *Vioa*, put forth in 1833 by Nardo (Isis, 1833, p. 523), for a genus said to be founded on "*Alcyonium asbestinum*, Linn.," and adopted by Schmidt (Spong. adr. Meer.), is here used in preference to *Cliona*, published in 1826 by Grant (Edin. New Philos. Journ. i. p. 79); for this name, under the form *Clione*, was already occupied, having been applied in 1774 by Pallas (Spicilegia Zool. fasc. x. p. 28) to a genus of Pteropodous Mollusca.

By the specific name the Sponge is dedicated to Mr. H. J. Carter, whose work in this difficult genus has done so much to elucidate its anatomy and determine its systematic position, and to whose assistance in my work among the British-Museum sponges I am so much indebted.

The species appears to stand near to the sponge figured by Schmidt as *V. johnstonii* in 1870 (*l. c. supra*), and there set down as a variety of the form which he described in 1862 (Spong. adr. Meer. p. 78, pl. vii. fig. 14), but which is obviously specifically distinct from that of 1862, on the ground of its almost totally different spiculation; for to the latter are attributed acerate and stellate forms as its complement, while the 1870 species<sup>1</sup> possesses a spinulate and two forms of spiro-spinular spicules (*cf.* Carter, Ann. and Mag. N. H. [5] iii. p. 149, who suggests this solution of the discrepancy between the two descriptions). It differs from this species chiefly in the absence of a short stout spirospinular flesh-spicule, and in the much greater fineness of the thin spiro-spinular form (the diameter being as 1 to 3 and the length as 1 to 2 of those of that species).

It seems to be also not far removed from *Clione lobata*, Hancock (Ann. and Mag. N. H. [2] iii. p. 343, pl. xii. figs. 4, 8, and [3] xix. p. 239, pl. vii. fig. 6), but differs from it in the stoutness of the spinulate spicule and the globose character of its head, and in the greatly inferior diameter and the less frequent angulation of the spiro-spinular spicule. That species is described as being *dark* in colour when dry; but as the colour when in spirit is not mentioned, it is not safe to compare it with *V. carteri* as to this point. Sollas's *C. subulata*<sup>2</sup> differs from this, apart from the colour (which is unfortunately not mentioned by him), in the greater stoutness of the body and greater distinctness of the head of the spinulate; its length and the length and characters of the spiro-spinular agree almost exactly with those of our species.

*Relations of the Horny and Siliceous Sponges of Magellan's Straits and the neighbouring Coasts to those of other Seas.*—I have gone somewhat more into details, in comparing the sponges described in this paper with allied forms, than is usual in papers of this kind. But I felt this to be desirable for two reasons:—1st, because the characters of the Sponge-fauna of these localities have hitherto been hardly investigated at all, and it is therefore important to ascertain its relations to those of other localities; 2nd, because in certain groups, chiefly in the *Renierida*, the possible range of variation of individual species seems to have been not clearly ascertained, owing mainly to the imperfection of our present knowledge of the relative classificatory values of the different characters; and as the nearest allies of the species here described were mostly from the Northern and Equatorial Atlantic, it was to be expected that in the passage to the southern part of the Atlantic Ocean we should find indications of the nature and extent of the changes which species have undergone (if that is the right way of expressing the relation) in making the same or the converse passage.

In the present state of our knowledge, the genera of the above groups of sponges as a rule embrace many species and are widely distributed. This is due probably to the want of a more minute subdivision of the genera, but also certainly to some extent to the great age of the group in time, and to its members being but little limited

<sup>1</sup> This should be renamed; and would be well called *V. schmidtii*.

<sup>2</sup> Ann. N. H. [5] i. p. 65, pl. ii. figs. 26-28.

in *space* by the natural barriers (wide and deep seas) which serve to break up such groups as the marine Mollusca and Crustacea into a very great number of comparatively distinct faunæ. In this collection, all the species but one have been assigned to genera already known from the North Atlantic, and three of the four already described species which occur in it were previously known as West-Indian forms, while the species most nearly related to the new species are chiefly Atlantic. When the Pacific sponges are as well known as those of the Atlantic, we may expect, looking at the geographical relations between this district and the Pacific, to find a considerable though probably much slighter resemblance between them and the Magellan forms. No detailed descriptions have been hitherto published of any New-Zealand sponges; so that such descriptions will be received with much attention when they appear, considering the intimate relations which the Vertebrate and Invertebrate faunæ of that district bear to that of the one at present under consideration, as far as they have been investigated. But indications are not wanting of a close connexion between the sponges of the two localities.

The results arrived at by comparison of the species found here with allied forms from other parts of the world may be conveniently arranged thus:—

Species already known.	Present locality.	Originally described as	Original locality.
<i>Hircinia hispida</i> , Lamk.	S.W. Chili.	<i>Spongia hispida</i> , Lamk.	"Southern Seas."
<sup>1</sup> <i>Cladochalina armigera</i> , Sdt., var. <i>pergamentacea</i> .	Off E. Brazil.	<i>C. armigera</i> , Sdt.	Florida and Antilles.
<i>Reniera fortior</i> , Sdt.?	St. of Magellan.	<i>R. fortior</i> , Sdt.	Antilles.
<i>Schmidtia aulopora</i> , Sdt., var.	S.W. Chili.	<i>S. aulopora</i> , Sdt.	W. Indies and Florida.

New species.	Locality.	Nearest described allies.	Locality.
<i>Aplysina</i> ? <i>regularis</i> .	St. of Magellan.	Not determined.	
<sup>1</sup> <i>Chalina coppingeri</i> .	Off E. Brazil.	<i>C. gracilentia</i> , Bowk.	Britain.
<i>Siphonochalina fortis</i> .	S.W. Chili.	<i>S. bullata</i> , Sdt.	West Indies.
<i>Phakellia egregia</i> .	St. of Magellan.	<i>Axinella cinnamomea</i> , Sdt.	Mediterranean.
<i>Ciocalypta calva</i> .	St. of Magellan.	<i>C. lee</i> , Bowk.	Britain.
<i>Esperia magellanica</i> .	St. of Magellan.	<i>E. nodosa</i> , Sdt.	Adriatic.
<i>Alabion proximum</i> .	St. of Magellan.	<i>Halichondria pattersoni</i> , Bowk.	Britain.
<i>Hymedesmia polita</i> .	St. of Magellan.	<i>Microciona tuberosa</i> , Bowk.	Straits of Malacca
<i>Trachytodania spinata</i> .	S.W. Chili.	Atlantic <i>Tedania</i> .	Atlantic.
<i>Tedania tenuicapitata</i> .	S.W. Chili.	<i>T. suctoria</i> , Sdt.	Iceland.
<sup>1</sup> <i>Vioa carteri</i> .	Off S.E. Brazil.	<i>Cliona subulata</i> , Sollas.	Hab. ?
Species undetermined.			
<i>Amorphinæ</i> sp.	St. of Magellan.	?	

<sup>1</sup> These species cannot be reckoned as belonging to the Magellanic fauna.

With regard to the *amount* of distinctness between the new species and their nearest allies, the remarks or tables given under each sponge should be consulted. It should be remembered, in estimating the relations of this fauna, that comparatively few species have been intelligibly described from any seas but the Atlantic and Mediterranean; but even allowing for that, the fact that in but one case the nearest ally is to be found outside those two areas speaks strongly for the *Atlantic facies* of the Magellan and S.W. Chilian fauna.

### Subclass CALCAREA.

The technical terms here used are those employed by Hæckel in his 'Kalkschwämme,' and with the meanings there applied to them.

The collection, it will be seen, contains the British form *Clathrina coriacea* (hitherto known only from arctic and north temperate seas) and the Australian species *C. poterium* as its sole representatives of a Magellan fauna. Considering the number of dredgings in shallow waters which have been taken here, this result may be considered as probably showing the extreme poverty of this region in Calcisponges. A striking contrast to this is furnished by the dredgings at the Victoria Bank, a shoal to the north-east of Rio de Janeiro, which was not visited by the 'Challenger,' and from which no Sponges have hitherto been described. Of the four (or possibly five) species which come from this locality, three are new, and a fourth has been assigned with considerable doubt to one of the species obtained. The well-known littoral habits of the Calcarea are thus brought forcibly to mind; for had they been fitted to live in deeper waters, it is almost inconceivable that more of them would not have spread from the mainland, whose fauna is already somewhat known.

#### CLATHRINA CORIACEA, Johnston.

(*Clathrina*, Gray, P. Z. S. 1867, p. 557; *Ascetta*, Hæckel, Kalkschwämme, ii. p. 14.)

*Spongia coriacea*, Montagu?, Wern. Mem. ii. p. 116.

*Grantia coriacea*, Johnston, Brit. Spong. p. 183, pl. xxi. fig. 9.

This species occurs on a few species of dead *Retepora*, forming either (a) a minute tube (*Auloplegma* form of Hæckel) running over the surface, expanding at intervals into a bulbiform dilatation, and varying in diameter from .18 to .426 millim., or (b) apparently a thin-walled sac of not less than 2.5 millims. extreme diameter. The sarcode is coloured reddish brown by an unevenly distributed pigment. The spicules agree with the common type figured by Hæckel in the 'Kalkschwämme,' pl. v. fig. 2, differing slightly from it in being sharply though abruptly pointed, and in being slightly inequilateral; they measure:—in (a), basal ray .1267 to .14 millim., laterals .095 to .114 millim. long, diameter .00844 to .0095; in (b), basal ray .114 to .2027, laterals .114 long, diameter .00844 to .0095 millim.

These measurements agree closely with those of the spicules of Johnston's specimens of *Grantia coriacea*. The distribution, already

increased by Carter (Ann. & Mag. Nat. Hist. ser. 4, xx. pp. 38, 40) to include the Arctic region, is now extended southwards and into the Pacific.

*Hab.* Tom Bay (S. W. Chili), 0-30 fathoms; on dead *Retepora*.

#### CLATHRINA POTERIUM, Hæckel.

*Ascetta primordialis*, var. *poterium*, Hæckel, Kalkschwämme, ii. p. 17, pl. v. fig. 1, *f-i*.

Found in the form of a running tube (*Auloplegma* form), as in (*a*) of the preceding species; diameter of tube  $\cdot 25$  to  $\cdot 53$  millim.; slightly pigmented with diffused red-brown pigment, concentrated into a granular mass in some places (possibly due to a siliceous or a horny sponge which grew in the neighbourhood). The triradiate spicules are of two sizes, as shown by Hæckel for his Australian variety *poterium*; but they are connected by intermediate stages. The large dermal form (which is occasionally bluntly pointed) varies in the diameter of its rays from  $\cdot 019$  to  $\cdot 02217$  millim.; one ray is usually about 7 : 6 of the length of the other two, being from  $\cdot 13937$  to  $\cdot 1774$  millim. long, while the smaller rays are  $\cdot 1267$  to  $\cdot 1584$  in length. The smaller, subdermal spicules have rays measuring about  $\cdot 118$  and  $\cdot 1267$  (respectively, in the one spicule) by  $\cdot 095$  to  $\cdot 01056$  millim. The largest of the larger triradiates only form a single surface layer; the smaller subjacent forms are much more numerous. The extreme diameter of the rays of the larger spicules is thus considerably less than the average diameter given by Hæckel for the Australian form, viz.  $\cdot 025$  millim.; and the smaller spicule-rays are considerably shorter in proportion to their length than in that form.

*Hab.* Tom Bay (S.W. Chili), 0-30 fathoms; on an *Idmonea* on which a horny sponge was growing.

*Obs.* I have followed Hæckel's suggestion (p. 23, *tom. cit.*), and advanced this form to the rank of a species, being justified, as I consider, in this course by the fact that it is constant to its main characters as described from the Australian specimens, even at the great distance from which it is now recorded. It is distinguished from *A. primordialis*, Hæckel, by the minimum diameter of its largest spicule-rays exceeding  $\cdot 02$  millim., and by the possession of a special dermal set of triradiate spicules considerably larger than those subjacent to them.

#### NARDOA PELAGICA, sp. n. (Plate XI. fig. 4.)

(*Nardoa*, Schmidt, *Adr. Spong.* p. 18; *Ascandra*, Hæckel, Kalkschwämme, ii. p. 80.)

Sponge forming a flattened cylinder, of about equal diameter from the mouth to the base, which is almost flat. Length 19 millims.; long and short diameters respectively 7 and 3 millims. Wall 1 millim. thick. Lip? Skeleton consisting of scattered stout acerates piercing the wall from the dermal to the cloacal surface, of an external layer of triradiates whose longest ray either points inwards or towards the base, of a less number of similar spicules imme-

diately interior to these and similarly arranged, and a gastral layer of sagittal triradiates, the basal ray pointing away from the gastral surface, which is covered with quadriradiates. Body-acerates straight, tapering from centre to sharp points, external end flattened, knife-like, with a central thicker longitudinal ridge, minutely roughened; size 1.25 by .06334 millim. Fine linear spicules of lip smooth, straight, size about .3 by .00475. Triradiates smooth, external ones irregular, angles about equal, all rays somewhat curved; rays respectively .1013 to .20 millim., .23 to .4, .32 to .45 in length by .019 to .022 in breadth; intermediate triradiates sagittal, angles equal or oral angle about  $130^{\circ}$ ; basal ray .4624 by .03167 millim.; lateral rays curved, .2724 by .03167 millim.; gastral triradiates sagittal, oral angle  $160^{\circ}$ , proportions and shape of rays the same as of intermediate spicules. Quadriradiates, two sizes: (1) with characters of gastral triradiate but with small straight apical ray; (2) smaller, lateral rays curved towards cloaca: sizes respectively, basal rays .38 by .03167 and .1267 by .0095 millim.; laterals .29 by .03167 and .1267 by .0095 millim.; apical .0565 by .01267 and .1267 by .0095 millim. Ratio of thickness of stoutest acerate to stoutest triradiate 2:1.

*Examined.* In spirit and by sections in balsam.

*Hab.* Victoria Bank (off S.E. Brazil), 39 fathoms; bottom, coral.

*Obs.* One specimen represents this species; the mouth is not well preserved. It is covered in places with a brown coating of degenerate tissue. It belongs to the same group of the genus as *N. (As-candra) echinoides*, Hückel, from Java, which it resembles in its flattened shape, and the form of the large acerate. But the largest triradiates are more than twice the size of those of that species, and two kinds of quadriradiate occur instead of one.

*APHROCERAS SERICATUM*, sp. n. (Plate XI. fig. 5.)

(*Aphroceras*, Gray, P. Z. S. 1858, p. 113; *Leucandra*, Hückel, Kalkschwämme, ii. p. 110.)

Sponge tubular, elongate; tube of almost equal diameter from the slightly fringed mouth to near the rounded basal end; length from 2 to 3 times as great as the maximum diameter. Canal-system and spiculation that of *Leucandra*, Hückel. Wall about 1 millim. thick, penetrated by long stout acerates measuring 2 to 3 millims. by .06 to .073 millim., smooth, sharply pointed, slightly thicker proximally, projecting from surface. Mouth fringed by a number of slender acerates about .014 millim. in diameter, smooth and straight. Internal triradiates sagittal, rays smooth, tapering to sharp points, slightly undulating, oral angle varying from  $110^{\circ}$  to  $160^{\circ}$ , lateral angles equal, basal ray measuring from .355 to .52 by .019 to .032, the laterals slightly smaller; external triradiates with aboral lateral generally only about half the length of the sagittal. Quadriradiates, rays smooth, gently curved and sharply pointed, facial rays each measuring from .18 to .25 by .0095 millim., apical ray from .16 to .2 by .0095 millim. Ratio of diameter of stout acerate to maximum diameter of rays of triradiate between 2 and 3:1. Colour (in spirit) white.



*Examined.* In spirit, and by sections in balsam and in spirit.

*Hab.* Victoria Bank (off S.E. Brazil), 39 fathoms; bottom, coral. Six specimens, one young.

*Obs.* This Sponge shows a considerable amount of variation in the size of the spicules in different specimens. One variety is especially well marked: its length is only twice as great as the breadth; its acerates reach the diameter of .09 millim. and length of 3.6 millims., its triradiates increasing proportionally in size, the diameter reaching .05 millim. It appears to be most closely allied to *A. (Leucandra) asperum*, Hæckel, from the Mediterranean, of described species; but differs from it in the inferior ratio of the thickness of the acerates to that of the triradiates, in the much thinner body-wall, in the larger and more slender apical ray of the quadriradiate, and in the formation of the oral fringe out of a special fine acerate form of spicule.

APHROCERAS CAMINUS, Hæckel (Plate XI. fig. 6), and var. *CRASSIOR*, sp. nov. (Plate XI. fig. 7).

*Leucandra caminus*, Hæckel, Kalkschwämme, ii. p. 175, pl. xxxi. figs. 1a-1d, xxxvii. figs. 5 A, 5 B, 6.

Three specimens occur in this collection from the same locality, two of which are apparently identical, and one differs considerably from them. The arrangement of the canal-system has not been made out very clearly; but it appears to be of the "traubenförmig" type described by Hæckel (*op. cit.* vol. i. p. 233) in *A. (L.) ananas*, Montagu, &c. with small circular cavities scattered through the walls of the body.

The two specimens, which agree with each other and with Hæckel's description, are ovate, 6 to 7 millims. long by about 4 millims. broad; the body-wall is 1.5 millim. thick at the sides; the mouth is funnel-shaped owing to the downward convergence of the walls of a slightly projecting "collar," which is 2.5 millims. across; the body-cavity is about 1 millim. broad. The other specimen, which may be termed var. *crassior*, is 7 millims. long by 4 broad; body-wall 1.5 millim. thick at sides; mouth probably about the same as in the normal forms (most of it has been broken away). The microscopic characters are tabulated below. Var. *crassior*, however, has the triradiates much larger (maximum size of ray of those of *caminus* = .65 by .075 millim.), the angles are all equal, not paired. The acerate is apparently longer; and the rays of the quadriradiates are straight, instead of the laterals and the apical being bent (as in *caminus*). Perhaps therefore *crassior* constitutes another species; but in the face of the single imperfect specimen it will be well to await better information.

<i>A. caminus</i> from off Brazil.		Var. <i>crassior</i> .
<i>Stout Acerate Spicules</i> .....	{ 1.4 to 1.6 mm. by .0434, smooth, straight, tapering to sharp points, scattered, not projecting.	About 2.5(?) mm. by .0434 to .0634, smooth, straight, tapering from near middle, scattered, not projecting.
<i>Fine Acerate of "Collar" ...</i>	{ About 1.4? mm. by .0095 to .01108, straight, smooth.	About 1.25(?) mm. by .095, straight, smooth.
<i>Triradiates ...</i>	{ From outer surface to near inner surface.	{ From outer surface to near inner surface.
i. Ray.....	{ Basal aborally(?) placed, .497 mm. to .53 by .057 to .075.	.64 mm. by .0634.
ii. & iii. Rays	{ Laterals .39 mm. to .43 by .0475 to .057.	.816 mm. by .0634.
	{ Rays tapering to sharp points from near base, slightly undulating. Gastrally-placed spicules directed towards cloaca, oral angle about 150°; the rest irregularly placed.	{ Rays smooth, slightly undulating, tapering to sharp points from base; angles equal; spicules variously placed.
<i>Quadriradiates ...</i>	{ On gastral surface and aggregated in groups in interior of wall.	{ On gastral surface and aggregated in groups in interior of wall.
	{ Lateral rays .14 mm. by .01267, or .228 by .019.	{ Facials about .32 mm. by .019.
	{ Basal, aborally placed, .14 mm. to .19 by .01267.	
	{ Apical .076 mm. by .0095.	{ Apical .16(?) or .32 mm. by .019, and some smaller ones like those of the typical form.
	{ Rays smooth, tapering to sharp points from base; basal and oral laterals slightly undulating, the rest straight. Oral angle 150° to 160°.	{ Rays smooth, tapering to sharp points from base, generally all somewhat curved. Oral angle either about 160° or 200°.

*Examined.* In spirit, and by sections in balsam.

*Hab.* Victoria Bank (off S.E. Brazil), 39 fathoms; bottom, coral.

*GRANTIA ATLANTICA*, sp. n. (Plate XI. fig. 8.)

(*Grantia*, Fleming, Hist. Brit. Anim. p. 524. *Sycandra*, Hæckel, Kalkschwämme, ii. p. 291.)

Sponge forming a single oval tube. Walls very thick (about two thirds the diameter of the cloaca) at centre, tapering to vent and closed end. Colour yellowish white in spirit. Vent surrounded by slight fringe of acerate spicules. Outer surface slightly roughened by points of acerate spicules, &c.; inner surface similarly roughened by apical rays of quadriradiates. Arrangement of canal-system agreeing with that of *Sycandra*, Hæckel; the straight radial tubes extend to within a short distance of the dermal surface; they are hexagonal, and are completely fused with each other by broad connexions; this intermediate substance is penetrated by narrow roundish "intercanals" running parallel with the radial tubes. The dermal layer, interposed between the ends of the radial tubes and the surface, consists of stout triradiate spicules and the exterior ends of the acerates. The substance of the wall between this and the cloacal surface is filled with the bases of the acerates, and with some more slender triradiate

spicules, whose sagittal rays lie between the radial canals, and whose lateral rays serve to enclose them. The cloacal surface is formed of a layer of mingled small and larger quadriradiate spicules.

*Acerate Spicules.* Straight, surface minutely rough, tapering to sharp points from the centre. Average maximum size 2.1 by .095 millim., extending from just beneath the cloacal to about one fourth of their length beyond dermal surface.

*Stout Triradiates.* Sagittal rays straight, surface slightly roughened, tapering to approximately sharp points from the base, forming three angles of about  $120^\circ$  each. Size of rays varying (average maximum size): basal from .304 by .04434 millim. to .424 by .05067, laterals from .2217 by .038 to .3167 by .04434—the proportion between the lengths of the two being thus 5 : 3 or 4 : 3. The basal ray is generally parallel to the long axis of the sponge, while one of the laterals projects from the dermal surface.

*Slender Triradiates.* Rays smooth, tapering from base to sharp points; the basal ray straight, the laterals either straight, or curving slightly forwards, or slightly undulating; the inwardly facing laterals form an oral angle of from  $160^\circ$  to  $180^\circ$  with each other; the basal points outwards; lateral angles equal. Size of rays varying (average maximum size): basal from .38 by .019 millim. to .3167 by .019, laterals from .152 by .0158 to .139 by .158; the proportion between the lengths of the rays is therefore 5 : 2 or 7 : 3.

*Quadriradiates.* Rays smooth, tapering from base to sharp points; basal straight, laterals slightly curved, either to or from cloacal surface, forming an oral angle of from  $130^\circ$  to  $170^\circ$ . Apical ray straight, projecting into cloaca. Size of laterals almost constant; apicals and basals vary inversely in length with each other. Basal ray either about .285 by .019 millim., or .04434 by .0095; laterals (average maximum) .08235 by .0095 to .101 by .01267; apical either .019 or .0507 by .006334.

*Examined.* In spirit and by sections mounted in balsam.

*Hab.* Victoria Bank (off S.E. Brazil), 39 fathoms; bottom, dead coral.

*Obs.* The species is represented by a single specimen 10 millims. long by 5.5 in extreme breadth. The projection of the points of the acerate and stout triradiate spicules from the surface is disguised to some extent by an aggregation between them of a yellowish material, which appears to be the result of desquamation of the surface tissues. This species resembles *Leucandra cyathus*, Verrill<sup>1</sup>, from Casco Bay, U. S., in its spicule-characters, and differs from all the species assigned to *Sycaandra* in the 'Kalkschwämme' of Hæckel by the possession of a cortical layer of triradiates with rays at least twice as stout as those of the triradiates forming the main substance of the sponge.

<sup>1</sup> Proc. Amer. Assoc. Adv. Science for 1873, p. 392.

## EXPLANATION OF THE PLATES.

## PLATE I.

(FISHES.)

*Neophrynichthys latus*, two fifths natural size. p. 20.

## PLATE II.

(FISHES.)

Fig. A. *Melanostigma gelatinosum*, p. 21.B. *Gymnelis pictus*, p. 20.C. *Mayneca patagonica* ad., p. 20.

D. ———— juv. p. 20.

All of the natural size.

## PLATE III.

(MOLLUSCA.)

Fig. 1. Terminal club of tentacular arm of *Onychoteuthis ingens*, p. 26.

1 a. Lateral view of one of the largest suckers.

1 b. A row of the teeth on the odontophore.

1 c. Upper mandible.

1 d. Lower mandible.

2. Dorsal view of *Loligo patagonica*, p. 24.

2 a. Side view of upper part of the body.

2 b. Lower or ventral side.

2 c. The shell.

2 d. A section of the broadest part of the shaft.

3. Dorsal view of *Rossia patagonica*, p. 22.

3 a. Ventral view of ditto.

## PLATE IV.

(MOLLUSCA.)

Fig. 1. *Pleurotoma (Bela) cunninghami*, p. 27.2. ———— (*Mangelia*?) *coppingeri*, p. 27.3. *Lachesis meridionalis*, p. 28.4. *Trophon fimbriatus*, p. 28.5. *Euthria atrata*, p. 29.6. ———— *meridionalis*, p. 29.7. *Nassa (Tritia) coppingeri*, p. 30.8. ———— (——?) *teniolata*, p. 30.9, 9 a, 9 b. *Lamellaria patagonica*, p. 32.10, 10 a. *Collonia cunninghami*, p. 33.11. *Trochus (Ziziphinus) consimilis*, p. 34.12, 12 a. *Tectura (Pilidium) coppingeri*, p. 35.13, 13 a, b, c, d, e. *Chiton (Ischnochiton) imitator*, p. 35.14, 14 a. *Helix (Patula) coppingeri*, p. 36.15, 15 a, b. *Helix (Patula) magellanica*, p. 36.16, 16 a. *Helix (Zonites?) ordinaria*, p. 36.17, 17 a. *Succinea patagonica*, p. 37.18, 18 a. *Chilina amara*, p. 37.

## PLATE V.

(MOLLUSCA.)

Fig. 1, 1 a, b, c. *Diplodonta lamellata*, p. 38.2, 2 a, b. *Macra (Mulinia) levicardo*, p. 39.3, 3 a. *Malletia magellanica*, p. 39.4, 4 a, b, c. *Pandora (Kennerlia) braziliensis*, p. 40.5. *Loripes pertenuis*, p. 41.6, 6 a, b. *Kellia magellanica*, p. 41.7. *Astarte magellanica*, p. 41.8. *Curdita (Actinobolus) velutinus*, p. 42.9, 9 a, b. *Carditella pallida*, p. 43.

## PLATE VI.

(POLYZOA AND CŒLENTERATA.)

Fig. 1. *Chaunosia fragilis*, p. 45. Zoecia  $\times 40$  diam.

a. From front; b. From side.

2. *Lichenopora grignonensis*, p. 57.a. Portion of peripheral part of colony, viewed from above,  $\times 26$  diam.; b. Single zoecial tube from peripheral aspect, to show the outwardly opening sinus in its wall,  $\times 26$  diam.3. *Gigantopora lyncoides*, p. 47.a. Two adjacent zoecia seen from front; b. Single zoecium seen somewhat from the side: both  $\times 40$  diam.4. *Lepralia appressa*, var. *vinosa*, p. 51.Two zoecia,  $\times 40$  diam.5. *Retepora altisulcata*, p. 53.a. Two adjacent oecia,  $\times 40$  diam.; b. Portion of back,  $\times 40$  diam.; c. Avicularium from middle of front wall,  $\times 80$  diam.6. *Schizoporella marsupium*, p. 48.Group of two zoecia and one oecium,  $\times 40$  diam.7. *Axohelia brueggemannii*, p. 102.a. Part of branch of the Brazilian specimen,  $\times 4$  diam.; b. Single calicle of the same specimen,  $\times 26$  diam.8. *Pedicellina australis*, p. 60.Full-grown zooid, with part of basal stolon, showing partial expansion of the disk,  $\times 17$  diam.9. *Smittia trispinosa*, var. *ligulata*, p. 53.Two zoecia,  $\times 40$  diam.10. *Tubulipora dichotoma*, var. *serialis*, p. 59.Part of zoarium,  $\times 30$  diam.11. *Labiopora moseleyi*, p. 106.a. End of small branch,  $\times 4$  diam.; b. Portion of surface of the same,  $\times 40$  diam.; c. Gonangium and surrounding tissue, from decalcified fragment, mounted in glycerine,  $\times 67$  diam.

[N.B. It should be noted that the preparation from which the last drawing was taken was made from the *dry* specimen; hence the indistinctness of the cœnosarcal canals.]

## PLATE VII.

(CRUSTACEA.)

Fig. 1. *Glaucothoë rostrata*, sp. n.,  $\times 3$  diam., p. 62.2. Frontal and antennal region of the same,  $\times 9$  diam.3. Fourth thoracic leg,  $\times 12$  diam.4. Fifth thoracic leg,  $\times 12$  diam.5. Terminal segment and uropoda,  $\times 12$  diam.6. *Pandalus paucidens*, sp. n.,  $\times 1\frac{1}{2}$  diam., p. 74.7. Rostrum of the same,  $\times 3$  diam.8. Terminal segment and uropoda of *Squilla gracilipes*, sp. n., nat. size., p. 75.9. *Arcturus coppingeri*, sp. n.,  $\times 2$  diam., p. 75.10. *Ega punctulata*, sp. n.,  $\times 1\frac{1}{2}$  diam., p. 77.11. Anterior view of the head of the same, showing eyes and antennæ,  $\times 3$  diam.12. First thoracic leg of the same,  $\times 3$  diam.13. Terminal segment and uropoda of *Corallana acuticauda*, sp. n.,  $\times 6$  diam., p. 78.

## PLATE VIII.

(ECHINODERMATA.)

Fig. 1. Apical area of *Strongylocentrotus bullatus*, slightly magnified, p. 88.

2. A small portion of the ambulacral area of the same, slightly magnified.

3. Apical area of *S.*, spec. juv., rather more highly magnified, p. 89.

4. A portion of the ambulacral area of the same, rather more highly magnified, p. 89.
5. *Calliderma grayi*, abactinal surface, natural size, p. 95.
6. *Ophioscolex coppingeri*, side view of part of an arm, to show the spines, magnified four times, p. 98.

## PLATE IX.

(ECHINODERMATA.)

- Fig. 1. *Asterias brandti*, sp. nov.,  $\times 2$  diam., p. 91.  
 2. — *alba*, sp. nov.,  $\times 2$  diam., p. 92.  
 3. — *obtusispinosa*, sp. nov.,  $\times 2$  diam., p. 92.  
 4. — *neglecta*, sp. nov.,  $\times 2$  diam., p. 94.  
 5. *Cycethra simplex*, sp. nov., nat. size, p. 96.  
 6. — —, actinal surface of ray,  $\times 1\frac{1}{2}$  diam.

## PLATE X.

(SPONGIDA.)

- Fig. 1. *Aplysina? regularis*, p. 108.  
 a. Fibre of external portion of section taken perpendicular to surface,  $\times 34$  diam.; b. Portion of skeleton,  $\times 375$  diam.  
 2. *Chalina coppingeri*, p. 110.  
 Spicules,  $\times 375$  diam.  
 3. *Siphonochalina fortis*, p. 111.  
 a. Fibre from section perpendicular to surface,  $\times 34$  diam.; b. Spicules,  $\times 375$  diam.  
 4. *Cladochalina armigera*, var. *pergamentacea*, p. 112.  
 a. Fibre from section perpendicular to surface,  $\times 34$  diam.; b. Spicule,  $\times 375$  diam.  
 5. *Eesperia magellanica*, p. 117. Specimen from Sandy Point.  
 a. Entire Sponge, reduced to one third nat. size; b. Main-skeleton spicule,  $\times 134$  diam., and head, further enlarged, to show character of central canal; c. Dermal-skeleton spicule,  $\times 134$  diam.; d. Inequianchorate flesh-spicule, from front and side,  $\times 375$  diam.; e. Bundle of fine acerate spicules,  $\times 375$ .  
 6. *Phakellia egregia*, p. 114.  
 The various forms of spicules,  $\times 67$  diam.  
 7. *Ciocalypia calva*, p. 115.  
 a. Part of fibre near its base, showing the imperfectly Holorrhaphidote character of the fibre,  $\times 67$  diam.; b. Skeleton-spicule,  $\times 134$  diam., and head, further enlarged, to show character of central canal.  
 8. *Alecion proximum*, p. 119.  
 a. Skeleton-spicules; b. Inequianchorate flesh-spicule, from front and side; c. Bipocillate flesh-spicule: all  $\times 375$  diam.  
 9. *Hymedesmia polita*, p. 121.  
 a. Smooth acute spicules,  $\times 134$  diam., and head, further enlarged; b. Spined spicules,  $\times 134$  diam.; c. Inequianchorate flesh-spicule, from front and side,  $\times 375$  diam.  
 10. *Trachytedania spinata*, p. 122.  
 a. Skeleton as seen in a perpendicular section of the entire thickness of the sponge,  $\times 34$  diam.; b. View of surface, showing dermal skeleton and its connexion with the main skeleton,  $\times 34$  diam.; c. Spined, and d. smooth acute spicules,  $\times 34$  diam.; e. Cylindrical spicule,  $\times 134$  diam., and head, further enlarged; f. Fine acute,  $\times 134$  diam.

## PLATE XI.

(SPONGIDA.)

- Fig. 1. *Tedania tenuicapitata*, p. 124.  
 a and c. Acute and acerate spicules,  $\times 134$  diam.; b. Cylindrical spicule,  $\times 134$  diam., and extremities, further enlarged.

2. *Vioa carteri*, p. 129.  
  - a. Skeleton-spicule,  $\times 134$  diam.; b. Different forms of the flesh-spicule,  $\times 375$  diam.
3. *Reniera fortior*?, p. 126.  
  - a. External portion of section of skeleton perpendicular to surface,  $\times 34$  diam.; b. Main-skeleton spicule,  $\times 375$  diam.
4. *Nardoa pelagica*, p. 133.  
  - a. Spicules of main wall in their natural mutual positions, as seen in a section perpendicular to surface,  $\times 34$  diam.; b. Portions of two of the fine acerate spicules,  $\times 67$  diam.
5. *Aphrocera sericatum*, p. 134.  
  - a. Spicules of main wall in their natural mutual positions, as in fig. 4 a,  $\times 34$  diam.; b. Portions of fine acerate spicules,  $\times 34$  diam.
6. *Aphrocera caminus*, p. 135.  
  - a. Spicules of main wall in their natural mutual positions, as in fig. 4, a,  $\times 34$  diam.; b. Portions of fine acerate spicules,  $\times 67$  diam.
7. *Aphrocera caminus*?, var. *crassior*, p. 135.  
  - a. Spicules of main wall in their natural mutual positions, as in fig. 4 a,  $\times 34$  diam.; b. Portions of fine acerate spicules,  $\times 67$  diam.
8. *Grantia atlantica*, p. 136.  
  - Spicules of main wall in their natural mutual positions, with the exception of the acerate, which is displaced inwards,  $\times 34$  diam.

## 2. Descriptions of some new Exotic Species of Moths. By J. O. WESTWOOD, M.A., F.L.S., &c.

[Received December 15, 1880.]

(Plates XII., XIII.)

Genus CASTNIA, Fabricius.

CASTNIA ERYCINA, sp. nov. (Plate XII. fig. 4.)

*Species minima in genere: alis anticis nigro-fuscis, certo situ metallice, basi chalybeo, apice viridi-nitidis; alis posticis supra chalybeo-nigris, costa late sanguinea, dimidio postico late viridi-argenteo, venis nigris diviso; corpore antennisque nigris chalybeo tinctis.*

*Expans. alarum anticarum lin.* 19.

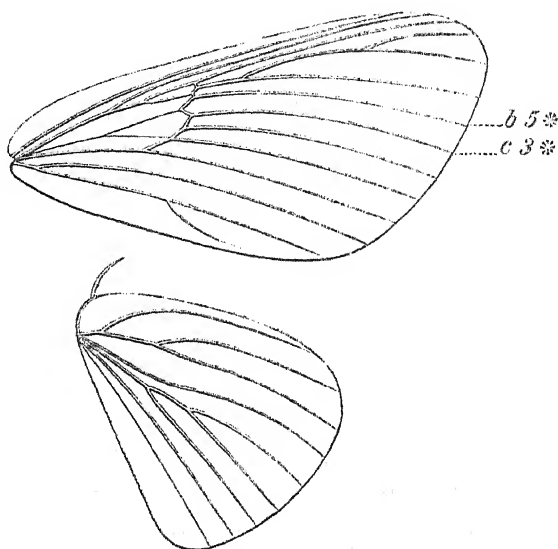
*Hab.* Eastern Ecuador (*Buckley*). In Mus. Salvin et Godman; etiam in Mus. Hopeiano Oxoniæ.

This lovely little insect formed part of a collection of insects from Eastern Ecuador, belonging to Messrs. Godman and Salvin, to whom the Hopeian Collection is indebted for a specimen. It was at first regarded as a butterfly and placed in the family Erycinidæ, to some of the species of which it bears a striking resemblance. The arrangement of the veins of the wings, however, proves its position in the genus *Castnia*, with none of the species of which, however, does it possess a very decided relationship. The branches of the postcostal vein form an oblong cell in front of the anterior division of the discoidal cell, which is closed in its upper part by the angulated base of the two discocellular veins (See fig. 1, p. 142, b 5\* and c 3\*). The anal vein emits a short branch in the middle of its hinder margin.

Mr. Clarence Buckley, by whom this species was captured, informs me that he took the specimens at Sarayacu, in a little clearing caused

by the fall of a tree, their habit being to sit with the wings open (flat?) on the tops of young leaves, then to take a slow flight round the clear space without fluttering the wings, and to settle again at the old

Fig. 1.

Wings of *Castnia erycina*.

place, whence, after remaining for a few minutes, they set off again for another round. He only found the species in this one spot, although there were plenty of similar open spaces caused by fallen trees in the neighbourhood. The flight of all the *Castniæ* is generally very rapid; but in this one it is just the reverse, and they were very easy to take either sitting or flying. He never took more than one any day; and sometimes for two or three weeks they seemed to disappear, when suddenly one would be found in the same spot and on the same tree.

#### Genus SATURNIA, Fabricius.

SATURNIA ARNOBIA, sp. nov. (Plate XII. fig. 2.).

S. alis anticis apice subacutis, posticis rotundatis, omnibus aurantiaco-fulvis fusco strigosis ocelloque medio, parvo, rotundato, vitreo, fusco cincto, fere ejusdem magnitudinis ornatis; anticis fascia parum undulosa inter basin et ocellum, altera submedia per ocellum currente, marginem internum attingente, tertiæque magis obliqua ad apicem alarum extensa et cum priore ad marginem internum connexa; alis posticis fascia media fusca a medio marginis analis fere ad marginem costalem (pone medium ejus extensa), parti superce ocelli insidente, strigæque undulosa fusco-rufa inter ocellum et marginem spatio inter strigam ex-



*ternam et marginem undulis obscurioribus parum distinctis notato; antennis brevibus, breviter bipectinatis: alis subtus similiter coloratis.*

*Expans. alarum anticarum unc. 6½.*

*Hab.* in Calabar Africæ tropicalis. In museo T. Chapman Glasguae.

SATURNIA HYPERBIUS, sp. nov. (Plate XIII. fig. 3.)

*Alis anticis ferruginosis, puncto minimo vitreo ad apicem cellulae discoidalis, striga fere recta obliqua pone medium alae cinerea, area pone strigam magis aurantiaca, margine apicali plumbeo tincto, ciliis rufis; alis posticis fulvis, ocello mediocri medio cinereo (medio albo) circulo nigro, striga angusta cinerea inter ocellum et marginem posticum plumbescens, ciliis rufis: alis subtus saturatioribus, venis flavis, anticis macula rotunda nigra, medio vitrea, ocello in posticis fere oblitterato, strigaeque pone medium angustiore et minus distincta; corpore rufo, abdomine magis fulvo.*

*Expans. alarum anticarum fere unc. 5.*

*Hab.* in Africa meridionali (D. Buxton). In Mus. Hopeiano Oxoniæ.

Affinis *Saturniæ* (*Bunee*) *nictitanti*, Fabr., Oliv.; antennæ in nostro individuo unico detritæ.

SATURNIA SCIRON, sp. nov. (Plate XII. fig. 3.)

*S. alis integris, rotundatis, pallide fusco-cervinis, omnibus ocello rotundato mediocri ejusdem magnitudinis fusco, subtus luteo, medio vitreo, supra lunula tenui fusca, intus albida, notatis; anticis striga perangusta lutea extus fusca, a medio marginis interni fere ad apicem alarum extensa, parum undulosa, nubilaque fusca transversa inter basin et medium alarum; alis posticis etiam nubila simili angulata inter basin et ocellum strigaeque pone ocellum fere obsoleta fusciscentibus; antennis fulvis, pectinibus brevibus, alternatim longioribus et brevioribus: alis subtus pallide fusco-albidis; anticis fasciis duabus undulosis obscuris pone medium vix notatis, alteraque integra fere semicirculari inter basin et ocellum alarum.*

*Expans. alarum anticarum unc. 5½.*

*Hab.* in insula Malayana Waigiou (*Wallace*). In Mus. Hopeiano Oxoniæ.

SATURNIA SERGESTUS, sp. nov. (Plate XIII. fig. 2.)

*S. alis anticis apice acutis, posticis rotundatis; omnibus albido-cervinis, ocello medio ovali fere ejusdem magnitudinis, carneo-fusco, supra lunula tenui alba alteraque carnea superato, extus semicirculo tenui nigro cingulato, medio ocelli vitreo, in alis anticis majore ovali, in posticis parvo rotundato, maculaque oblonga nigra, in his extus adjecta; alis anticis prope basin striga tenui transversa subcurvata nigricante alteraque brevi inter basin alarum et ocellum transversa; omnibus fascia tenui nigra communi extus albo marginata, inter ocellum et marginem apicalem*

(fere angulum apicalem anticarum attingente), margine alarum pone hanc fasciam magis fusco-vinosa; antennis rufescentibus, breviter pectinatis; collo albo; corpore alis concolori.

*Affinis* *S. mylittæ*.

*Expans. alarum anticarum unc.*  $6\frac{2}{3}$ .

*Hab.* in Japonia. In Mus. Hopeiano Oxoniæ.

*SATURNIA IOLE*, sp. nov. (Plate XII. fig. 1.)

*S. alis anticis subfalcatis, apice rotundato, posticis elongatis angustis, omnibus basi cinereo-fusca; anticis fascia lata alba fere mediana, lunula media angusta curvata alba, medio vitreo, spatio pone fasciam magis rufescente, ocello ovali prope apicem alæ parvo nigro, albo anguste cincto, strigaeque tenui ab ejus apice fere ad angulum posticum extensa cum margine ipso parallela; alis posticis inter basin et medium lunula alba, postice in fasciam latam pallidam dilatata, ad angulum analem extensa, ocelloque lunato albo, linea media vitrea, margineque postico luteo, in margine superno fasciæ insidente; alis posticis pone fasciam pallide fuscis, striga pallidiore margini parallela; corpus fuscum, collaris albo, abdomine albido, segmentis in media basi fuscis; antennis subfulvis, satis late bipectinatis.*

*Expans. alarum unc.*  $4\frac{1}{2}$ .

*Hab.* in Assama Indiæ orientalis. In Musæo Hopeiano Oxoniæ.

*SATURNIA (EUDÆMONIA) ARGIPHONTES*. (Plate XIII. fig. 1.)

*Eudæmonia argiphontes*, Maassen in litt., Kirby, Trans. Ent. Soc. Lond. 1877, p. 20.

*Affinis Bombyci brachyuræ, Drury (argus, Stoll), ut major alisque posticis in mare multo longioribus. Faunicolor, alis anticis fascia fusca valde obliqua prope basin, fere ad medium costæ extensa, alteraque fere recta inter medium et apicem per alas posticas ad marginem analem extensa, spatio pone hanc fasciam in anticis albo, cervino extus pallide tincto; spatio inter medium alæ et fasciam guttis 5 vel 6 flavis fusco cinctis, medio cujusque minute vitreo; cauda alarum posticarum inter medium et partem dilatam albida; alis anticis fœminæ medio magis fulvescentibus, fasciis duabus purpureo-fuscis, externa extus anguste albo marginata, colore albo ad costam parum dilatato; alis posticis in fœmina cauda tantum dimidium ejus in mare æquante, et parte media ejusdem magis fusca instructis.*

*Expans. alarum unc.*  $3-3\frac{1}{4}$ .

*Long. caud. alar. post. ♂ unc.*  $5\frac{3}{4}$ , ♀ unc.  $2\frac{1}{4}$ .

*Hab.* Sierra Leone Africæ tropicalis. In Mus. reg. Dublinensi.

The preceding description of both sexes and accompanying figure of the male of this extraordinary species were made from the pair of typical specimens in the Museum of the Royal Dublin Society, kindly submitted to me by Mr. W. F. Kirby in 1877, since which period that gentleman has published the following description of the species in the 'Transactions of the Entomological Society of London':—

"Allied to *brachyura*, Drury (*Argus*, Stoll). Brown, ♀ paler. Wings shaped as in *brachyura*, and slightly scalloped as in that species;

a common dark stripe edged externally with whitish (at least on the fore wing, where the costa is suffused with whitish between the stripe and the apex) extends from the costa of the fore wings to the inner margin of the hind wings at about two thirds of the length of the wing; near the base of the fore wings is a similar stripe, more oblique, and diverging from the other, not reproduced below; tails of the same shape as in *S. brachyura*, and edged with darker, as are also the fringes of the wings; a narrow pinkish line runs down the greater portion of the tail in the male; the tails in the female are much more broadly edged with darker for two thirds of their length; near the outer stripe of the fore wings runs a row of four small vitreous spots, edged with yellow and black, within which are two smaller detached spots in the female and one in the male; the vitreous spots are larger, and the yellow edging less distinct in the female than in the male; hind wings with five similar but smaller spots within the stripe, placed irregularly. Underside similar, but paler; basal stripe of fore wings absent. Body extending for half the length of the hind wings in the male, and for three quarters in the female, tails not included. Antennæ with very distant pectinations."

## EXPLANATION OF THE PLATES.

## PLATE XII.

- Fig. 1. *Saturnia iole*, p. 144.  
 2. — *arnobia*, p. 142.  
 3. — *sciron*, p. 143.  
 4. *Castnia erycina*, p. 141.

## PLATE XIII.

- Fig. 1. *Saturnia (Eudemonia) argiphontes*, p. 144.  
 2. — *sergestus*, p. 143.  
 3. — *hyperbius*, p. 143.

3. On the Elephant Seal, *Macrorhinus leoninus* (Linn.).

By WILLIAM HENRY FLOWER, LL.D., F.R.S., P.Z.S., &c.

[Received January 4, 1881.]

The Museum of the Royal College of Surgeons of England has lately received from the Falkland Islands a very fine skull of an adult Elephant Seal. As this is a larger specimen than any with which I am acquainted, I have thought that it might interest the Fellows of the Society to see it; and I have availed myself of the opportunity afforded me by its exhibition to put together some notes regarding certain points in the structure and affinities of an animal which, notwithstanding its former abundance and wide distribution, and its great zoological interest, is still very imperfectly known anatomically, and very poorly represented in collections.

The skull was presented by Mr. Herbert Mansel, at the kind suggestion of Mr. F. Coleman, Secretary of the Falkland-Islands Company, who has made such excellent use of his opportunities in connexion with these islands to advance our knowledge of their zoology. Mr. Mansel has been good enough to furnish me with the following information about the animal from which the skull was obtained:—"I cannot now give you the exact date when the Elephant was killed, but it was sometime in 1879. The particulars of the capture are these. I was riding one afternoon along the south coast of the east island, about 45 miles west of Stanley, the principal settlement, when I perceived what I took to be a long boat turned upside down on the beach. On approaching nearer I discovered it was an enormous Seal asleep. I thought at first it was dead; but while watching I saw it half-open one eye. I then threw a stone at it; and when struck, it suddenly reared itself up on its flippers to the height, I should think, of 8 or 10 feet, opening its enormous mouth to its widest extent. After this I kept at a respectful distance, pelting him until he thought he had enough of it, and he made slowly for the water, making as much fuss as a large steamer. On going back to the house, I mentioned what I had seen to one of my men (an old inhabitant), who said it must have been an Elephant. He had never seen one, but said he had heard old sealers say they killed them by finding them asleep, giving them a poke in the side, and on their rearing up in the manner described firing into their mouth. He went out the next morning with his gun, and found the animal in the same place, and despatched him in the manner I have mentioned. I have been living in the Falkland Islands upwards of five years, and during that time never saw or heard of one having been seen. I may safely say one has not been seen in the Islands for the last ten or twelve years. They were never, I believe, plentiful, and now are extremely rare, as they were much sought after by the sealers on account of the quantity of oil they produced and the value of it, as it brought a much higher price than the oil procured from other Seals. The Elephant in question measured a little over 21 feet, and must have weighed several tons."

In response to further inquiries, Mr. Mansel adds:—"I did not notice the proboscis while the animal was asleep, but when roused it was inflated and very distinct, about a foot in length. The colour was the same as that of most Phocidæ, a dirty blue-black"<sup>1</sup>.

It will be observed that the attitude assumed by the animal when disturbed, described by Mr. Mansel, corresponds very much with that of the original figure of the so-called "Sea Lyon" of Anson<sup>2</sup>, of Juan Fernandez, upon which Linnæus founded his *Phoca leonina*, and the jaws and teeth of which, still preserved in the museum under my charge, prove the identity of the species with that now under consideration. The habit of raising the head and fore part of the body,

<sup>1</sup> With regard to the occurrence of the Elephant Seal in the Falkland Islands in former times, see Captain C. C. Abbott, P. Z. S. 1868, p. 189.

<sup>2</sup> 'Voyage round the World,' 1748.

and widely opening the mouth, is so noticed by Pernetty<sup>1</sup>. It may be remarked that the accuracy of Anson's figure as regards the attitude assumed by the animal when attacked, though ridiculed by Péron, is fully vindicated by Mr. Moseley in his interesting account of the Sea-Elephants of Kerguelen's Land<sup>2</sup>.

The skull appears to be that of an adult but by no means aged individual. The sutures between the basi-sphenoid and the basi-occipital on the one side, and the presphenoid on the other, are both still open, as in all the skulls of Elephant Seals I have yet examined. The crowns of the teeth are moderately worn; and the root of the great upper canine has not yet closed in at the base, which, judging from many specimens examined, it appears only to do in extreme old age.

Its relative size to that of other known skulls of animals of the same species may be estimated by the following figures, giving the length from the fore end of the premaxillaries to the occipital condyles in millimetres:—

	millim.
Skull presented by Mr. Mansel, No. 3921 A .....	564
The largest skull in the Museum of Comparative Zoology, Cambridge, Mass., U. S. A., from Heard Island <sup>3</sup> ....	510
Largest skull in the Museum of Natural History, Paris <sup>4</sup> ..	508
Largest skull in the Berlin Museum, obtained in Kerguelen by the German Transit-of-Venus Expedition <sup>5</sup> .....	490
Skull in Mus. Roy. Coll. Surgeons, No. 3921, locality unknown .....	463
Skull in Mus. Roy. Coll. Surgeons, No. 3920, locality unknown .....	438
Largest skull in the British Museum .....	380 <sup>6</sup>

<sup>1</sup> "Lorsqu'ils aperçoivent quelqu'un approcher d'eux, ils s'élèvent ordinairement sur leurs deux pattes-nageoires, tels qu'on les voit dans la figure 1 Pl. IX. Ils ouvrent une gueule à recevoir, aisément une boule d'un pied de diamètre; et la tiennent ainsi béante, en gonflant l'espèce de trompe qu'ils ont sur le nez."—*Histoire d'un Voyage aux Iles Malouines fait en 1763 & 1764*, edit. 1770, tome ii. p. 45. The figure referred to is an unacknowledged copy of that of Anson. A still older observer, W. Funnell, mate to Captain Dampier, says, speaking of the "Sea-Lion" (as it was then generally called, because, as the author conjectures, "his Roaring is not unlike that of the Lion") of Juan Fernandez, in 1703:—"If they are hard pursued, they will turn about and raise their Body up with their Fore-fins, and face you, standing with their Mouth wide open upon their Guard: so that when we wanted to kill one to make Oil, we used commonly to clap a Pistol just to his Mouth, as it stood open, and fire it down his Throat."—*A Collection of Voyages*, vol. iv. p. 15 (1729).

<sup>2</sup> Notes by a Naturalist on the 'Challenger' (1879), p. 201.

<sup>3</sup> J. A. Allen, 'History of North-American Pinnipeds' (1880), p. 748.

<sup>4</sup> For this information I am indebted to Dr. H. Gervais. It was brought home in 1831 by D'Orbigny. That figured in Blainville's 'Ostéographie,' if not the same specimen, is of the same dimensions.

<sup>5</sup> Kindly communicated to me by Dr. Peters.

<sup>6</sup> The Museum of the University of Oxford possesses the anterior portion of the skull of a young male from Burchell's South-African collection, and the complete skeleton of a still younger female. The species is at present not represented in the excellent Osteological Museum at Cambridge.

The dimension given above does not express the whole length of the largest skull, though it does of the smaller ones, as in the older animals the occipital ridges become so greatly developed as to project backwards beyond the condyles. This takes place to such an extent in the case of the new skull as to give an extreme length of 597 millimetres, or  $23\frac{1}{2}$  inches. In very young skulls, on the other hand, the most posteriorly projecting part is the middle of the squama occipitis, at or above the upper margin of the foramen magnum. This expresses the preponderance of the brain-case over the other parts of the skull at this stage of development. In the next stage the growth of the condyles outruns that of the brain-case; and finally the development of the great crests for muscular attachment give a very different general aspect to the cranium.

The remaining principal dimensions of this skull are the following :—

	millim.
Extreme width across zygomatic arches .....	384
Width between occipital crests .....	242
Greatest width of palate .....	185
Width of maxillæ across middle of rostrum .....	176
Width between outer sides of base of upper canines.....	158
Width between apices of upper canines.....	120
Width between outer sides of base of upper lateral incisors.....	60
Width between outer sides of base of lower canines.....	93
Length of palate, from notch in middle line behind to incisor teeth .....	272
Length of ramus of lower jaw .....	375
Greatest width between condyles of lower jaw .....	352

I have great hopes of obtaining, if not the whole skeleton, at least some of the principal bones belonging to the skull now described, as Mr. Mansel informs me that, after securing the head, he left the remainder of the body above high-water mark at the spot where it was killed. We shall then have the means of verifying his estimate of 21 feet, which I presume includes the length of the hind feet or flippers, and which will probably be not far from the maximum to which the animal reaches.

It is probable that, as in many of the Pinnipedia, and indeed in animals of almost all other groups, there is some variation in the size attained by adult specimens; and the head, especially of the males, continues to increase in magnitude some time after the animal has apparently reached maturity, by the addition of bony outgrowths, ridges, and crests for the attachment of muscles, and by the enlargement of the alveolar portions of the jaws for the support of the increasing roots of the great canine teeth. But the statements of those voyagers who ascribe a length of 25 or even 30 feet to some individuals of this species must of course be taken with considerable reserve, and require to be verified by the accurate measurements of actual specimens. It would be strange if the natural tendency to

exaggerate the size of every thing large had not had its influence in this case, as it undoubtedly has with Cetaceans, Sirenians, and other marine "monsters."

Skeletons are far more valuable than skins or stuffed specimens for giving dimensions, as the latter are susceptible of considerable factitious enlargement. Unfortunately there is not, as far as I can learn, any skeleton of a perfectly adult male Elephant Seal in any museum in Europe. The largest appears to be that at Berlin, of which I have given the size of the skull above, and of which the stuffed skin, according to Mr. J. W. Clark<sup>1</sup>, measures 14 feet 6 inches in length from tip of nose to tip of tail, and 16 feet 3½ inches to the extremity of the hind flippers, taking the measurement along the curve of the back. Dr. Peters gives the length of the vertebral column of this specimen as 3700 millims.<sup>2</sup>, which, added to the length of the skull (490 millims.), gives 4190 millims., or 13 feet 9 inches for the whole length. Whether allowance has been made for the intervertebral spaces or not I do not know. Mr. J. A. Allen gives the length of the skeleton (nose to tail), allowing for the probable length of the intervertebral cartilages, of a male, said to be adult, from Heard Island, in the Museum of Comparative Zoology at Cambridge, Mass., as 4340 millims., or 14 feet 3 inches<sup>3</sup>. The skull of this specimen is 480 millims. long. Skeletons of very young animals, between four five feet in length, are common in museums.

*Dentition.*—Leaving out of consideration the exceedingly aberrant and specialized Walrus, the teeth of the Elephant Seal are more reduced in number, size, and form than those of any of the Pinnipedia, the only other member of the group which agrees with it in most of these characteristics being the closely allied *Cystophora* of the northern seas.

The dentition when complete is *i.* 2, *c.* 1, *pm.* 4, *m.* 1, though it frequently happens that one or more of the true molars, especially those of the upper jaw, are rudimentary or wanting. All the teeth, even the canines, are remarkable for their comparatively small enamel-covered crowns, and for the large size of their simple roots, which continue to grow in width as well as length during the adolescence of the animal, and are further enlarged in thickness by the addition of a considerable layer of cementum to their outer surface. In this character the teeth resemble those of many of the Odontocetes, so much so that in the case of isolated fossil teeth of the Crag formation it is often very difficult, if not impossible, to say whether they belong to Cetaceans or to Seals. Although other Pinnipeds show this peculiarity, it is carried to its greatest extent in the Elephant Seal. The very small size of all the teeth except the canines, and more especially those of the molar series, in proportion to the great magnitude of the animal, is very striking. They must, in fact, be almost functionless.

<sup>1</sup> Nature, Sept. 2, 1875, p. 366.

<sup>2</sup> Monatsb. der k. Akad. der Wissenschaft. zu Berlin, 1875, p. 393, footnote.

<sup>3</sup> *Op. cit.* p. 749.

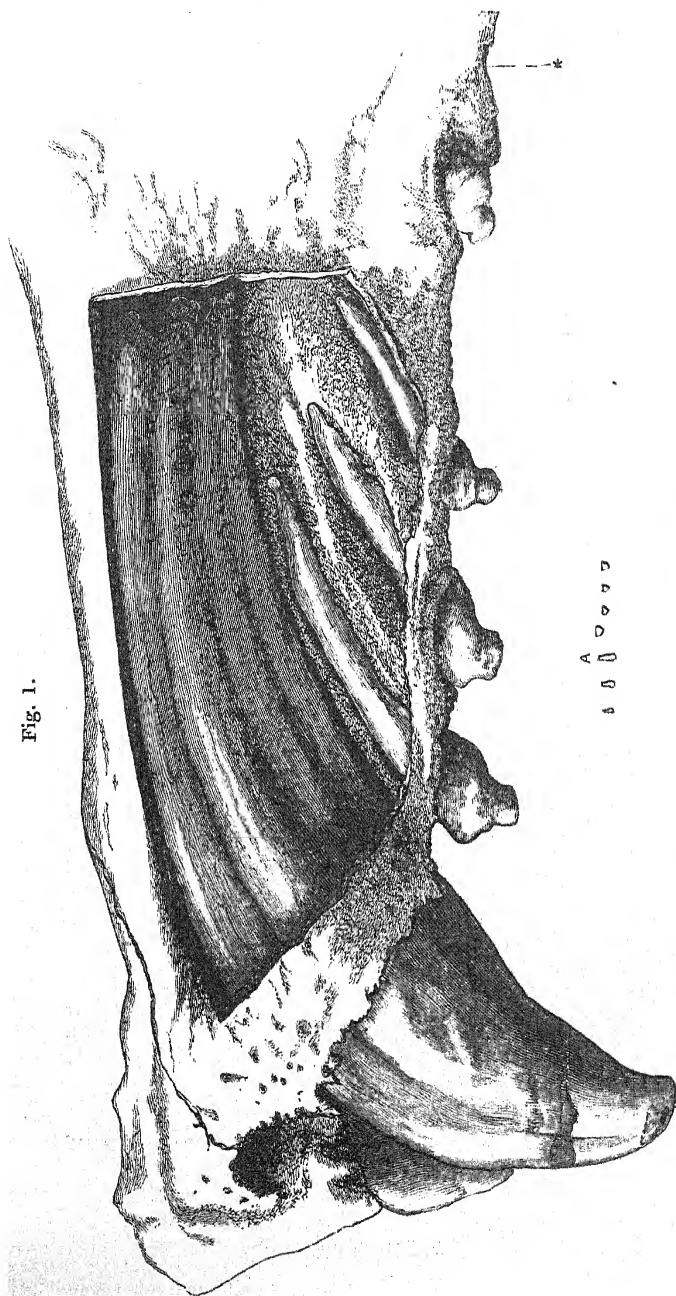


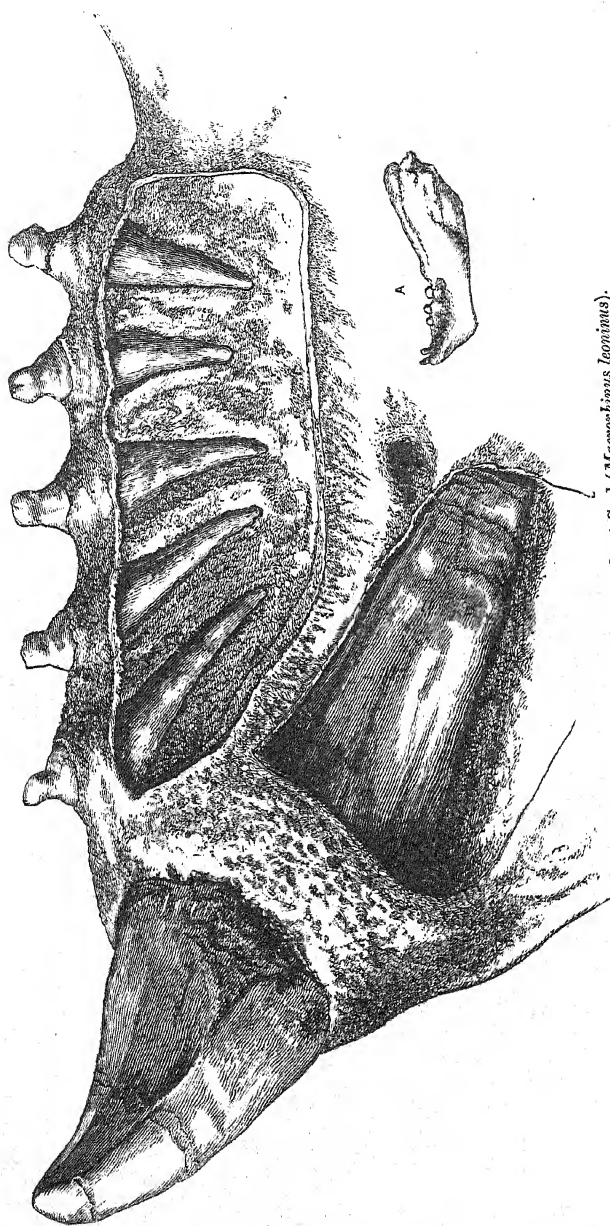
Fig. 1.

Side view of upper teeth of adult male Elephant Seal (*Macrorhinus leoninus*), natural size.

\* Socket for rudimentary molar; A. calcified milk-teeth of foetal female Elephant Seal, also of the natural size.



Fig. 2.



Side view of lower teeth of adult male Elephant Seal (*Macrorhinus leoninus*).  
 A. Lower jaw, with milk-teeth of fetal female Elephant Seal, natural size.

The molars are reduced to the extreme of simplicity (see figs. 1 and 2, pp. 150, 151). Each has a single long, tapering root, shaped somewhat like a carrot, having a thickened shoulder near the neck, caused by the deposition of cementum, and which projects above the alveolus in old animals. The root of the first upper molar is the longest, measuring in the large skull as much as 60 millims. Each of the others is shorter than the one in front of it, to the last, which is not unfrequently rudimentary or absent. In the present case there is no trace even of a socket, on the left side; though on the right side there is a small shallow cavity, from which a tooth appears to have been lost (fig. 1, \*). In the lower jaw the roots are more equal, that of the first being slightly the longest, and the fifth nearly as large as any of the others. This, however, is absent, as well as that of the upper jaw in No. 2921, which has thus  $\frac{4}{5}$  teeth of the molar series, all premolars, according to what is now known of their homologies.

The crowns, when young, present traces only of the division into pointed cusps or lobes, so characteristic of the molars of most Seals—mere grooves upon the surface, becoming deeper towards the apex, to which they converge, and marking off rudimentary cusps, more distinct on the outer than the inner surface of the tooth. The fifth molar in both upper and lower jaws is of more simple character than the others, often only a simple cone.

In animals soon after birth these teeth are crowded together, the first being placed in contact with the canine. In this stage the teeth consist of little more than the crowns, the incisors and molars being all equally developed and in their places, and the canines with their apices only appearing above the level of the alveolus; the roots are only commencing to calcify; but as they grow in length and width, not only does each require more room, but they become separated from one another by intervals, which are most extended in the oldest individuals. The five molars of a very young male (No. 3934 A) occupy a space from before backwards of 44 millims. In the largest skull (3921 A) the same teeth are spread over 116 millims.

In an old skull in the Leiden Museum (of which, the hinder part being broken away, I am not able to give the length) not only the whole of the crowns, but even the necks, of all the molar teeth, except the last upper one, have been worn away, and what appear at first sight to be the crowns are merely rounded stumps of dentine and cementum, of very much larger size than the real crowns of the teeth of the young animal.

The sexes even of the youngest specimens can be recognized by the comparatively small sizes of the crowns of the canines in the females. In the males there is some difference in this respect, as the following figures (measurements in millimetres) show, though the variations are comprised within certain limits:—

	<i>Female.</i>	<i>Male.</i>					
		<i>Very young.</i> 3934 A.	<i>Adult or nearly so.</i>				<i>Largest of Mr. Moseley's specimens.</i>
			<i>Anson's.</i> 3923.	3920.	3921.	<i>Mr. Mansel's.</i> 3921 A.	
Upper canine :—							
Length of enamelled crown	17	29	28 <sup>1</sup>	25 <sup>1</sup>	30	24 <sup>1</sup>	26 <sup>1</sup>
Ant.-post. diameter at base	10	21	18	18	21	21	21
Transverse diameter at base	8	16	16	16	18	18	20
Lower canine :—							
Length of enamelled crown	15	29	28 <sup>1</sup>	23 <sup>1</sup>	31	25 <sup>1</sup>	...
Ant.-post. diameter at base	10	21	20	19	23	22	...
Transverse diameter at base	7	...	16	15	19	17	...
Width between outer borders of upper canines at base of enamelled surface.....	44	54	100	107	128	140	...

I have examined many isolated canines of Elephant Seals, including some which Mr. Moseley has been kind enough to put at my disposal, which he selected as the largest he could find from a number of skulls lying on the beach at Heard's Island, and find none with crowns materially larger than those mentioned above, or differing greatly in the form or size of the root. I have, in fact, seen no tooth which, crown and root together, measures in a straight line between the apex of the crown and the middle of the root more than 6 inches, or 150 millims., or which exceeds in greatest diameter 1·6 inch, or 40 millims., though these dimensions are very nearly reached in all the specimens which show signs of maturity. I am therefore not disposed to attach the same importance to Pernetty's statement of teeth of this animal in the Falkland Islands 7 inches long<sup>2</sup> and 3 in diameter, which my friend Dr. Peters does, and to infer from it the existence of a distinct species. It is, of course, possible, though as yet without proof, that in former times, before these animals were subjected to the severe struggle for existence occasioned by the remorseless pursuit of the sealers, many, or at least some favoured individuals, may have acquired a much larger size than at present; but before accepting the statement above quoted, it would be necessary to know whether the tooth of a Sperm Whale, or some other Cetacean, may not have been mistaken for that of a Sea-elephant.

<sup>1</sup> Apex worn.

<sup>2</sup> If measured along the curve, this would scarcely exceed the ordinary size as to length; but the "trois pouces de diametre" is difficult to understand, especially as he adds, "Ce n'est pas une des plus grandes;" and what does Pernetty mean by "nous en avons compté vingt-deux telles que celle-ci dans la mâchoire d'un de ces lions, à laquelle il en manquoit encore cinq ou six; elles étoient solides dans toute leur longueur, et ne sailloient guère plus d'un pouce ou d'un pouce & demi, hors de leurs alvéoles"? (*op. cit.* p. 48). Surely it must have been the jaw of an *Orca*, and not a Seal, that he was describing!

*Milk-Dentition.*—As is well-known, in the Seals generally the milk-teeth are extremely rudimentary in size and form, and perfectly functionless. They mostly never cut the gums, and are actually absorbed before birth. In a specimen of *Phoca vitulina*, which was born in the Society's Gardens in 1868, and which survived its birth exactly one week, the only traces of milk-teeth remaining were small rudiments of the upper canine and one molar on one side only. All the permanent teeth were in a nearly equal state of development<sup>1</sup>. The same condition has been observed in all the other species which have been examined. In *Cystophora cristata*, the nearest ally of the Elephant Seal, the milk-teeth, as observed by Reinhardt, are still more rudimentary<sup>2</sup>. On the other hand, in the Eared Seals (*Otariidae*), which more nearly approach the terrestrial Carnivora in many points in their structure as well as habits, the milk-teeth are better developed and less evanescent than in the true Seals, the canines especially being of moderate size and retained for several weeks.

In the youngest skulls of the Elephant Seal which I have been able to examine, and which, from their size and general development, must be little more than new-born, the whole of the permanent teeth are fully in place, except the great canines, of which the apices only are appearing above the alveoli; and I am not aware of any observations upon the milk-teeth of these animals, except one, which I was fortunate enough to make some years ago<sup>3</sup>, and which, from its extremely interesting nature, may be worth repeating here, especially as I am enabled to exhibit the specimen to the Society for comparison with the huge skull and teeth of the adult animal (see figs. 1A and 2A, pp. 150, 151). A foetal Seal is preserved in the stores of the Museum of the Royal College of Surgeons, only 11 inches (28 millims.) long from nose to end of hind feet, whence obtained I am not able to say, but which presents all the external characteristics of the species under consideration, and which, it should be mentioned, is of the female sex. It has no hair, except the whiskers and tufts over the eyes. The five short conical nails are all developed upon the fore feet. On the hind feet the position of all the nails is indicated by extremely minute depressed dots in the skin a little distance from the end of the skin of the toe; in the three middle toes, which are of nearly equal length, these dots are scarcely 2 millims. from the extremity. In the two outer, longer toes they are about 9 millims. from the end, and more conspicuous than the inner ones. I mention these because it is often stated that there are not even rudiments of claws on the hind feet of the Elephant Seals.

The jaws contained a set of very minute calcified teeth, viz.  $i. \frac{2}{1}, c. \frac{1}{1}, m. \frac{3}{3}$ , on each side, being the complete number of milk-teeth which the species would have; for the incisors and canines should

<sup>1</sup> See W. H. Flower, "Notes on the First or Milk-Dentition of the *Mammalia*," Trans. Odontological Society, vol. iii. 1871, p. 211.

<sup>2</sup> "Om Klapmøysen's ufødte Unge og dens Melketandsæt," Naturhist. Vidensk. Meddelelser for 1864.

<sup>3</sup> See 'Journal of Anatomy and Physiology,' vol. iii. 1869, p. 270.

be of the same number as the permanent set, and the milk-molars of all Seals, and indeed of the Carnivora generally, are  $\frac{2}{3}$ , corresponding to the second, third, and fourth premolars of the second dentition. There was, in addition, in the upper jaw a small cap of dentine, in the situation of the apex of the first permanent premolar—a tooth which, in its development, is almost coeval with the milk-teeth, and has no predecessor. The permanent dental formula of the Elephant Seal is thus determined to be  $i. \frac{2}{1}, c. \frac{1}{1}, p. \frac{4}{1}, m. \frac{1}{1} = 30$ , as given above.

The incisors and canines are cylindrical, with rounded, rather truncated crowns, and are open at the base. The upper canine, which is the largest tooth, and of which the whole of the crown and greater part of the root are calcified, measure 3 millims. in length and 1 millim. in greatest thickness. The second upper incisor is about half this size, and the first still smaller. The molars consist only of a rounded crown, scarcely more than 1 millim. in diameter, with the commencement of a single root, which, however, is not calcified.

As the crowns of teeth, once calcified, never enlarge in diameter, we may presume that these rudimentary teeth had attained their full dimensions, except, perhaps, as to the length of the root in some of them. They therefore, in contrast to the size of the animal and of the permanent teeth, represent one of the most rudimentary conditions in which it is possible to imagine the existence of a set of milk-teeth complete as to number; and they form the last term known at present of a series, beginning with the ordinary terrestrial Carnivora, such as the Canidæ, and passing through the Bears, the Otariidæ, and the other known members of the Phocidæ. The step from this condition to the completely monophyodont state of the Cetacea is not very great. These teeth probably disappear long before birth; but foetal Elephant Seals at later stages of development are greatly required, in order to trace the progress of dentition.

*Auditory Ossicles.*—The auditory ossicles of the Elephant Seal have been described and figured in the elaborate memoir by Mr. Alban Doran on these structures<sup>1</sup>, which merit more attention than they have hitherto received as guides to affinity. Before the publication of this memoir, or the formation of such a collection as that now to be seen in the Museum of the College of Surgeons, it was impossible to appreciate their value, as it is only by studying the modifications of any part in a tolerably extensive series of forms that its essential characters can be deduced and separated from those that are variable and comparatively unimportant, and the true relative value assigned to the different modifications met with.

The auditory ossicles of the Seals generally differ from those of their allies, the terrestrial Carnivora, in their large size and the massive and exuberant growth of the bone composing them. It is very remarkable, and may perhaps indicate some, though not yet understood, relation to the conditions under which these animals live, that in this respect they resemble the other aquatic mammalia, the Cetacea and the Sirenia.

But it is only in this, perhaps an adaptive character, that the

<sup>1</sup> Trans Linn. Soc. 2nd series, Zoology, vol. i.

resemblance consists: the bones are constructed upon quite a different type; and though the similarity is masked by this curious overgrowth or hypertrophy of bone in certain parts, it can be shown, by the existence of intermediate forms, that their resemblance is, on the whole, to those of the land Carnivora. As might be expected, the intermediate forms are found in the Otariidæ; and nothing can display so strikingly the importance of the characters derived from these bones than to see the retention in *Otaria*, with the external pinna and scrotum, and power of use of the hind limbs, an incus and stapes far more resembling the corresponding bones in the Ursidæ than in the Seals.

*Macrorhinus*, on the other hand, has extremely modified ossicula. The stapes is a simple subcylindrical mass, and, being thicker and more rounded towards the incudal than at the attached end, has almost a bell- or bottle-shape, with scarcely a trace of division into crura. In this respect it resembles that of the Walrus alone among the Pinnipedia. The incus is a very remarkable bone, its ordinary characters being quite masked by the immense globular development of the posterior and outer part of the body, or that which lies over the processus brevis, and which throws the articular surface quite away from its normal upward aspect. Owing to this bulky form of the body, the bone is larger than that of any other known mammal, except *Manatus*. A deep elongated pit or groove, running in the internal face from the middle of the articular surface, is another characteristic. A similar, though less extreme, dilatation of the body is found in all the true Seals, but the peculiar pit only in the *Stenorhynchus*; indeed, as Mr. Doran has pointed out, it is to the incus of these, rather than to the (in so many respects more nearly allied) *Cystophora*, that this bone of *Macrorhinus* bears most resemblance. After remarking that this bone is "only a caricature," so to speak, of that of *Phoca*, as its posterior part assumes and exaggerates the Phocine type, the form of the long crus induces Mr. Doran to believe that the incus of *Macrorhinus* is a truly central form. But the form of this crus is obviously very variable, even in the series of closely allied Seals figured at the top line of plate lx. of the memoir; and it may be doubted whether the peculiar long slender and subcylindrical limb of the incus in *Macrorhinus* should be regarded as retention of a generalized form, as it certainly is not exactly paralleled in any other.

The malleus also more resembles that of *Stenorhynchus* than that of any of the other Seals.

*Systematic Position and Affinities.*—In any natural arrangement of the existing Pinnipeds, the Elephant Seal appears to me to form the extreme term of the series, as it is the one which combines in itself in the fullest degree all the characters by which the Seals are distinguished from the terrestrial Carnivora. It is, if I may so say, the most "seal-like" of all the Seals. The Walrus as regards its dentition is more highly specialized, but in a direction peculiar to itself; and in other characters, as those of the limbs, it retains a more generalized form. The Elephant Seal and, though perhaps to a slightly less degree, the Bladdernose have kept nearer to the

direct line of modification, only carrying it out to a more complete extent than have the ordinary Seals.

As far as our imperfect knowledge of its osteology allows us to judge, in all points in the anatomy of the limbs in which the Phocidæ differ from the land Carnivores, such as the general proportions of the bones, especially the shortness of the femur, the want of development of the calcaneal process, the articulation of the fifth metacarpal with the proximal row of carpal bones, the Elephant Seal presents the extreme of modification. The true Seals (*Phocinæ*) have well developed claws on both the fore and hind feet; and the toes of the posterior limbs are subequal, the first and fifth being only slightly longer than the others; and the interdigital membrane does not extend beyond the toes. In the Elephant Seal the claws of the fore limb are reduced, and in the hind limb are absent or excessively rudimentary; the first and fifth toes of this limb are greatly enlarged beyond the others, and the skin prolonged in lobes beyond the true end of the digit, producing a much greater modification of the whole foot from the terrestrial type, and causing a considerable superficial resemblance to the forked caudal appendage of a Cetacean or Fish. This character of the pedal extremity is possessed also by the *Stenorhynchinæ*, which are in many respects intermediate between the *Phocinæ* and the *Cystophorinæ*. Another and still more important character in the structure of the limbs, in which the Seals resemble the Cetacea and differ from all other known mammals, is most strongly marked in the Elephant Seals, as is well seen in the young skeleton mounted in the Museum of the College of Surgeons. It is that all the phalanges of both limbs (except the unguinal phalanges) are ossified from three centres, an epiphysis being developed for each extremity, instead of a single epiphysis at the proximal extremity, as is the rule throughout the class. How far this occurs in other Pinnipeds is not certainly known. *Stenorhynchus leptonyx*, as shown in the not quite adult skeleton from New Zealand, presented to the Museum of the College of Surgeons by Mr. W. L. Crowther, F.R.C.S., resembles the Elephant Seal in this respect. In the true Seals of our hemisphere (*Phocinæ*), if it occurs, it is as a much less obvious and more transient condition, as I have not been able to detect the double epiphysis in any of the young skeletons in the Museum<sup>1</sup>.

The modifications of the *ossicula auditus* have been already referred to as showing that the Elephant Seal presents an extreme form, though here also *Stenorhynchus* is its nearest congener.

In the dentition also it has been shown that the characters by which Seals differ from other mammals are carried to their fullest extent in the Elephant Seal. The Leopard Seals (*Stenorhynchus*) may be regarded as showing the greatest perfection of the type, in the even row of exactly similar, finely developed, and sharply cusped, two-rooted molars; while in the Elephant Seal the same type has under-

<sup>1</sup> In the pes of a young *Phoca vitulina* in the Oxford Museum there are traces of epiphyses on the distal as well as the proximal end of the metacarpal of the hallux.

gone its greatest degradation, a few more stages of which would leave the animal little better provided with these organs than are the Ziphioid Cetaceans.

The form of the brain-cavity of the Elephant Seal, as shown by the casts in the Museum of the College of Surgeons, is remarkable for its great width posteriorly compared with its length, and presents the greatest contrast, among the Seals, to that of *Otaria*, which differs but little from that of the terrestrial Carnivora. The short, globular form of the brain, as well as the numerous and closely packed convolutions of the surface of the hemispheres, is one of the many characters by which the Seals resemble the Cetacea. There is much in the general appearance of the skull of the Elephant Seal, especially the fore part, with its short nasal bones, broad depressed muzzle, wide flat palate, and simple, conical, recurved teeth, which presents some resemblance to the Carnivorous members of that group, such as *Orca*; and it is singular, if only as a coincidence, that Mr. Mansel's large specimen shows a want of symmetry in the form of the anterior nares, the ossified septum being bent to the right, which recalls one of the peculiarities which distinguish the skull of most of the toothed Whales<sup>1</sup>. In the small development of the coronoid process of the lower jaw the Elephant Seal surpasses any of the Phocine series, and is furthest removed from the land Carnivores.

As far as can be gathered from the narratives of those who have had the opportunity of observing this animal alive, its habits confirm the views derived from its structure. It appears to be more helpless on land and more active in the water than the other members of the group<sup>2</sup>.

All the characters hitherto mentioned have been only modifications or exaggerations of those met with in other Seals, and are shared by some one or other of the group. There is one remarkable evidence of specialization which it possesses in common only (with modifications in detail) with its near ally *Cystophora cristata*—the dilatable sac connected with the nasal passages, developed (like so many of the singular pouches accessory to the respiratory organs) only in adult males.

As I have had occasion to mention many structural points in which the Elephant Seal appears to approach nearer than other members of the group to the Cetacea, I must guard myself against being supposed to infer that it is genealogically in any way a connecting-link between the two. The Seals appear to me so distinctly an offshoot of the terrestrial Carnivora, that any consanguinity between them and the Cetacea must be excessively remote; and if the Elephant Seal is the most modified and specialized of the group, and

<sup>1</sup> Prof. Huxley points out several characters in which the Seal's skull is "strikingly Cetacean" ('Manual of Anatomy of Vertebrated Animals,' 1871, p. 425).

<sup>2</sup> See Péron, 'Voyage de découverte aux Terres Australes,' 1816, tome ii. p. 45; also Scammon, 'The Marine Mammals of the North-west Coast of North America' (1874), p. 117; Weddell, 'A Voyage towards the South Pole' (1825), p. 136. This is also the opinion of Mr. Moseley, one of the most capable and observing of naturalists who have come into contact with Sea Elephants in their native haunts.



therefore, in all probability, a comparatively recent form, it must be one of the most distant instead of nearest in true relationship, and all its resemblances to the Cetacea must be purely analogical and adaptive to existence under similar external conditions.

Apart from these speculations, the facts which have been brought forward will, I think, be sufficient to induce practical zoologists to revise their systematic classifications of the Pinnipeds, in which this genus is almost invariably placed either in the middle of the group or next to the Otariidæ. I would suggest that it ought to be placed as far as possible from the latter, the whole of the other Seals and the Walrus coming between. After its most close ally, the Bladdernose (*Cystophora cristata*), the Leopard Seals of the southern hemisphere (*Stenorhynchinae*) come nearest to it.

*Generic and Specific Designation.*—Since the dismemberment of the Linnean genus *Phoca* by Nilsson in 1820, the Elephant Seal has been placed by various authors either in the genus *Cystophora* (Nilsson, 1820), *Macrorhinus* (F. Cuv. 1824), or *Mirounga* (Gray, 1827), modified by its author in 1847 to *Morunga*. The latter, founded upon a native Australian name mentioned by Péron, is clearly inadmissible, being exactly synonymous with *Macrorhinus*, which antedates it by three years, and which is now very generally used by the best authorities<sup>1</sup>.

The question between *Cystophora* and *Macrorhinus* depends upon the varying estimate of the value to be assigned to a generic distinction. If the Bladdernose and the Elephant Seal are held to be sufficiently distinct in their organization to require separate generic appellations, the one will be called *Cystophora* and the other *Macrorhinus*. If otherwise, they will be both included under *Cystophora*, the older and equally appropriate designation. The differences between them have been carefully pointed out in Allen's recent monograph, and chiefly consist in the comparatively larger size of the crowns of the molar teeth, the frequent doubling of the root of the posterior, and occasionally of the penultimate, upper molar in the smaller species, combined with the greater prolongation of the palate backwards, the presence of claws upon the hind limbs, the less emargination of the distal border of the hind feet, the greater size of the pelvis and posterior extremities generally (which, according to Allen, are very feebly developed in the Elephant Seal), and the different form of the nasal appendage of the adult males. Differences of the auditory ossicles have also been pointed out by Mr. Doran. In all these characters, it will be observed, the Elephant Seal has undergone a further stage of specialization than the Bladdernose.

It is a case in which, if they had never been separated, I, for one, should have been inclined to allow them to remain in the

<sup>1</sup> It should be mentioned that F. Cuvier, as was his custom, only used the French form "*Macrorhine*" in the article in the *Mém. du Mus.* 1824, xi. p. 200, which gives some countenance to the citation of his first use of the genus *Macrorhinus* (as in Agassiz, 'Nomenclator Zoologicus') in the 'Dictionnaire des Sciences Naturelles,' xxxix. 1826, art. *Phoque*, and therefore to the priority of Latreille's use of the same name in the *Fam. Nat. du Règne Animal*, 1825, for a genus of Coleoptera.

same genus, especially as each subdivision contains but a single well-marked species; but as the separation has now been so generally adopted, and the name *Macrorhinus* has become so deeply rooted in zoological literature, perhaps more inconvenience would result from an attempt to reunite them than to retain them as distinct genera, and we may be content to show their close affinities by their union in one subfamily, *Cystophorinae*.

The Elephant Seal has been known in zoological literature by three specific names, viz.:—*leonina*, Linn., founded on the so-called "Sea-Lyon" of Juan Fernandez, described and figured in Anson's Voyage, 1748, and undoubtedly the species under consideration; *elephantina*, Molina, 1782, revived by Gray; and *proboscidea*, Péron, 1815. The former, though, perhaps, the least appropriate, is clearly the first in point of time; and as in using it we are not resuscitating a name that has become obsolete, or been entirely superseded by another that has met with general acceptance, it may be adopted with equal respect to the laws of priority and convenience; in fact all recent zoological literature shows that this name is gaining ground over both the others which have been proposed as substitutes.

*Unity or Plurality of Species.*—The Elephant Seals which inhabit the Pacific coast of North America, formerly abundant, but now extremely reduced in numbers by the persecutions of the sealers, are supposed by Theodore Gill to be specifically distinct from those of the southern hemisphere, and have received the name of *Macrorhinus angustirostris*<sup>1</sup>.

In J. A. Allen's valuable and exhaustive monograph on the North-American Pinnipeds this distinction is adopted; but although the author speaks of the two species as presumably distinct, he says that, "so far as can be determined by descriptions, the Northern and Southern Sea-elephants differ very little in size, colour, or other external features." From evidence not very satisfactory, he supposes the southern species to be on the whole somewhat the larger of the two. The osteological characters upon which Gill bases his distinction are derived from the comparison of the skull of a probably full-grown female Californian Seal with the figure given by Gray in the 'Zoology of the Erebus and Terror,' of a two-thirds grown male (the one now in the British Museum) from the South Seas. This is incorrectly described by Gray as an "adult female;" and Gill has accepted this determination without question, although the characters of the skull, as seen in the drawing, the unworn condition and size of the canines, and open state of the sutures are sufficient to throw much doubt upon it. Unfortunately there is no skull of an adult female Sea-elephant in this country available for comparison; but from what may be inferred from other species of Seals, and from the evidence afforded by young specimens, it may be considered almost certain that the very character on which Gill has chiefly relied for specific distinction is a sexual one. The comparative narrowness of the muzzle is associated with the smaller deve-

<sup>1</sup> Proc. Essex Inst. v. 1866, p. 13; Proc. Chicago Acad. Sci. i. 1866, p. 33.

lopment of the canine teeth, as can be well seen in the figures of the type skull of the female *M. angustirostris*, as given by Allen. On comparing the upper surface of this with a series of male skulls, it will be seen that the difference consists chiefly in the extent to which the maxillæ project beyond the sides of the præmaxillæ, which in the former is almost *nil*, and in the latter very considerable, to allow room for the roots of the great canines on each side of the præmaxillæ. Even in the youngest skulls this difference in the sexes is seen. The variations in the proportion of the breadth of the rostrum measured at the middle, halfway between the nasal orifices and the ends of the præmaxillæ, in different specimens, are shown in the following table:—

	Length of skull.	Breadth of middle of rostrum.	Proportion, length of skull being 100.
	mm.	mm.	
Very young female, No. 3934, Mus. Roy. Coll. Surg. ....	204	46	22.5
The type specimen of <i>M. angustirostris</i> (according to Allen's fig.), female .....	.....	.....	24.3
Very young male, No. 3934 A, Mus. Roy. Coll. Surg. ....	233	59	25.3
Adult male, No. 3920, Mus. Roy. Coll. Surg. ....	437	144	33.0
Adult male, No. 3921, Mus. Roy. Coll. Surg. ....	463	154	33.3
Adult male, No. 3921 A .....	564	176	31.2

There is certainly one character by which the type specimen of *M. angustirostris*, judging from Gill's description and Allen's figure, differs from any of the skulls of southern Elephant Seals with which I have compared it. This is the shorter antero-posterior extent of the palate-bones, and the deeper emargination of their hinder border. Before this distinction can be accepted as a specific character, it should be known whether it is constant. There is much variation in the size of the palate-bones of the southern forms: the length from before backwards between the palato-maxillary suture in the middle line and the spine in the large skull No. 3921 is but 35 millims.; in the somewhat smaller skull, No. 3920, the same distance is as much as 51 millims.; and in the largest skull (No. 3921A) it is 65 millims., therefore about double that of the skull which comes nearest to it in general size.

When the idea prevailed that each species was separately created in the region which it inhabits, geographical reasons were stronger than now for assigning specific distinction. But Allen fully admits, indeed suggests himself, that the two presumed species, though long isolated, have been derived from one stock, "the southern being an

offset of the northern, because the only other known species of the *Cystophorinae* is also northern."

Now it seems to me that if we are to accept the presumption that they are distinct upon geographical grounds alone, we must bid adieu to what little still remains to us, after the revolution of the last twenty years, of our conception and definition of a species. For how long in time and how far in space must two branches of one stock of animals be separated in order to constitute a claim to specific distinction? I should answer this question by saying, only either when they have become so far physiologically differentiated as no longer to interbreed (a point on which it is, of course, extremely difficult to get evidence), or when permanent recognizable differential structural characters have been established. Until we are sure that they are either physiologically or morphologically distinct we have no grounds for separating them. In fact, by doing so, we are concealing or ignoring a most important zoological fact, viz. that under certain circumstances members of a group may become and remain for a long period of time isolated from the parent stock without appreciable variation from the original type taking place. Show any character in which the one has departed from the other, however small, so that it be constant and universal, then the case is altered, and it becomes a subject for consideration whether the amount of variation is sufficiently great to be consistently admitted as specific. But even this stage does not appear to be yet reached in the case of the northern and southern Elephant Seals.

The evidence upon which Dr. Peters has based the four supposed species of southern Elephant Seal, viz. *leonina*, *falklandica*, *probo-scidea*, and *kerguelensis*, is still more shadowy; but these were only put forth by him as suggestions of possibilities, not as ascertained facts.

P.S. Since the greater part of the above was written, I have heard from my friend Prof. Turner of Edinburgh that he has in his hands for description the skeletons of a male and of a female Elephant Seal from Kerguelen, and a skull of a large male from Heard Island, brought home by the 'Challenger' Expedition. The latter, Mr. Moseley informs me, he selected as one of the largest out of hundreds which lay on the beach at the time of the 'Challenger's' visit, Feb. 6, 1874; it is, however, considerably smaller than the specimen described above, having a condylo-premaxillary length of 20 inches (483 millims.) and an extreme length of 19 inches (508 millims.). It is to be hoped that this large additional material will soon be made available for reference. A good figure of the skull of an adult female is at present an especial desideratum.

January 18, 1881.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The following report on the additions to the Society's Menagerie during the month of December 1880 was read by the Secretary :—

The total number of registered additions to the Society's Menagerie during the month of December 1880 was 104, of which 21 were by birth, 21 by presentation, 53 by purchase, 2 by exchange, and 7 were received on deposit. The total number of departures during the same period, by death and removals, was 129.

The most noticeable additions during the month were :—

1. A young female Red Wolf (*Canis jubatus*) from the Argentine Republic, presented by Mr. W. Petty, of Monte Video, being the second example of this scarce animal we have received.

2. A Pig from Brooker island, Louisiade archipelago, presented by Lieut. De Hoghton, of H.M.S. 'Beagle.'

I can only refer this Pig, which, I think, belongs to a wild species, to *Sus papuensis*, although it does not well agree with Lesson's description and figure of that species.

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The following papers were read :—

1. On the Birds collected in Socotra by Prof. I. B. Balfour.  
By P. L. SCLATER, M.A., Ph.D., F.R.S., and Dr.  
G. HARTLAUB, F.M.Z.S.

[Received December 21, 1880.]

(Plates XV.-XVII.)

The collection of birds which I now exhibit was made by Prof. I. Bayley Balfour and his party (consisting of Alexander Scott, botanical collector, and Lieut. Cockburn, of the 6th Regiment, and attendants) between February 11th and March 30th, 1880. Prof. Balfour landed at Gollonsir, at the extreme north-west end of the island; and after exploring the adjacent country to the S. and S.W., marched along the north coast to Hadibu, the capital.

Having established their dépôt on the Hadibu plain, about a mile from the town, they spent the time until the 7th March in investigating the magnificent Haggier range of hills shutting in on the south the Hadibu plain.

On March 8th, leaving a Lascar in charge of the dépôt at Hadibu, they started upon a trip to the eastern end of the island, going eastward along the northern side, and returning westward by the southern side of the island. During this trip they reached Ras Momé, the extreme eastern headland. The camp at Hadibu was again entered on March 18th.

As yet the party had not seen much of the southern parts of the island; so on March 22nd they left Hadibu on their last excursion. Crossing the Haggier range, they emerged upon the southern shore at Nogad, traversed the coast-line for some distance, and then re-crossed the island, so as to come down upon Kadhab village on the north side. They regained Hadibu on the 27th inst., and left for Aden on March 28th<sup>1</sup>.

The collection contains 124 examples in skin, and two in spirit. They are referable to 36 species, belonging to the following nine Orders:—

	Ex.	Sp.		Ex.	Sp.
i. Passeres.....	83	17	vi. Columbæ....	16	2
ii. Picariæ.....	2	1	vii. Gallinæ....	1	1
iii. Accipitres....	3	3	viii. Limicolæ....	11	7
iv. Herodiones ..	2	2	ix. Gaviæ.....	4	2
v. Anseres.....	4	1			

Of these, seven of the Passeres appear to be new species.

#### i. PASSERES.

##### 1. CISTICOLA INCANA, sp. nov. (Plate XV. fig. 1.)

*Supra tota pallide et obsolete grisescenti-fusca, immaculata; alis totis dorso concoloribus; pileo vix conspicue rufescente; subtus albida, cinerascens lavata; loris albidis; subalaribus et subcaudalibus albis; maxilla fusca, mandibula pallida, hujus apice fuscescente; rectricibus intermediis dorso concoloribus, lateraliumparte apicali obscuriore, albido bimaculata; pedibus pallidis. Long. tota 4·4, alæ 1·8, caudæ 1·8, tarsi 0·9 (poll. Angl.).*

Of this little *Cisticola* there are three adult male specimens, all alike in colour, and two nestlings. The beak is long, very straight, slender and much compressed in the apical portion. Wings short, obtuse, and weak. Feet rather large. This is apparently an undescribed species.

"Found on the higher grassy plains. Note a sharp 'tit'".—

I. B. B.

##### 2. DRYMCECA HÆSITATA, sp. nov.

*Supra notæ plumis fuscis, late pallidius marginatis, uropygio subrufescente; subtus pallide fusco-cinerascens immaculata; subalaribus et subcaudalibus sordide isabellinis; cauda gradata, rectricibus fuscis, sub certa luce fasciolatis, ante apicem pallidum late et obscure fusco adumbratis; rostro fuscescente, mandibula pallidior; pedibus carneo-pallidis. Long. tota 4·0, alæ 1·9, caudæ 1·6, tarsi 0·7.*

This little *Drymceca* (with ten rectrices), of which there is but one specimen in the collection, is so very like the well-known *D. madagascariensis*, that at first sight we considered it to be identical. But

<sup>1</sup> See the Report of the Socotran Committee in Rep. Brit. Assoc. 1880, p. 212.

after a more accurate study we have changed our opinion. The Socotran species is altogether a smaller bird; and the relative dimensions are different, the tail being decidedly longer in *D. hæsitata*. It is also differently coloured, the tips of the rectrices not showing a well-defined large white spot as in *D. madagascariensis*, but only a narrow pale brown apical margin: this is constant. The feet are conspicuously larger in the Madagascar bird.

So much, however, is certain, that *D. hæsitata* comes nearer to the Madagascar species than to any other!

"Met with on the trees in the date-groves; also on the shrubs on the hill-slopes."—*I. B. B.*

### 3. SAXICOLA ISABELLINA (Cretschm.).

*Saxicola isabellina*, Heuglin, Orn. N.A. i. p. 344.

One skin (female) of this Chat, a well-known species of Eastern Africa and S.E. Asia.

"In the valley Ferâgih and on the plain of Nogad, south side of the island. Met with perched on the shrubs."—*I. B. B.*

### 4. SAXICOLA MONTANA, Gould.

*Saxicola montana*, Gould, B. Asia, pt. xvi. (1876).

Mr. Seebohm tells us that this Chat (of which five males and five females are in the collection) is *S. montana* of Central Asia, and not, as we should have been inclined to name it, *S. deserti*. The most salient point of difference of these two nearly allied species is that in *S. montana* the white on the basal portion of the inner webs of the primaries and secondaries comes up to the shaft of the feather, instead of being confined to the interior margin. *S. montana* breeds in Tibet and Eastern Turkestan, but was obtained by Blanford in Baluchistan in December and March.

"Common on the sands of the plains. Has a curious note, between a croak and a hiss."—*I. B. B.*

### 5. ANTHUS SORDIDUS, Rüpp.

*Anthus sordidus*, Heuglin, Orn. N.A. i. p. 326.

Six skins of an *Anthus* in the collection come nearer to this species of Africa and Western Asia than to any other described form. They are, however, rather large in dimensions, and have the bill large. Moreover the plumage of the back is more mottled (especially on the rump) than is usual in *A. sordidus*.

"On all the plains. Very common, and wonderfully tame."—*I. B. B.*

### 6. MOTACILLA ALBA, Linn.

*Motacilla alba*, Heuglin, Orn. N.A. i. p. 316.

Four examples, apparently of this species.

"Common on all the perennial streams, where they reach the lower plains."—*I. B. B.*

7. *BUDYTES FLAVUS*, Linn.

*Budytes flavus*, Heuglin, Orn. N.A. i. p. 320.

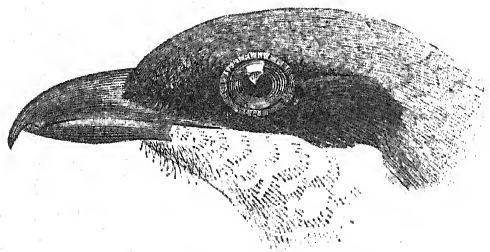
Three skins of this species or of the Indian form *B. viridis*. In one skin there are traces of a yellowish stripe over the eye.

"Only seen on the mud-flats extending inland a short distance from the head of Ghor Gharrieh."—*I. B. B.*

8. *LANIUS UNCINATUS*, sp. nov.

*Supra late et pure cinereus; fasciola frontali stricta fasciæque lata a rostro per oculum ducta circumscripte nigris; alarum tectricibus nigris; remigibus tertiariis nigris, limbo apicali albo; remige primo spurio toto nigro, reliquis primariis nigris, in parte basali late et oblique albis, scapis nigris; primarii secundi pogonio externo toto nigro; subalaribus pure albis; rectricibus 4 intermediis nigris, limbo apicali vix conspicuo albo, sequentibus nigris, apicibus latius albis, secunda pro maxima parte et externa tota albis; subtus dilute albido-cinereus; gula et subcaudalibus dilutionibus; rostro fortiter hamato et compresso, nigerrimo; pedibus nigris. Long. tota 8·0, alæ 3·9, caudæ 4·0, tarsi 1·2. Fem. obsoletius tincta et potius fusco-nigricans, ubi mas niger.*

Fig. 1.

Head of *Lanius uncinatus*.

Nine examples of this apparently new Shrike are in the series. It comes nearest to *L. fallax*, but is remarkable for its much hooked bill.

"A very solitary bird. Found on those parts of the island where there are trees. None at the east extremity, nor on the Nogad plain on the south side. Females I had some difficulty in getting. The male perches on the top branches of the trees, and there utters a melancholy note. Nom. vulg. 'Tāvifi.'"—*I. B. B.*

9. *ZOSTEROPS HABYSSINICA*, Heuglin.

*Zosterops habyssinica*, Heuglin, Orn. N.A. i. p. 413.

A pair of this species; obtained the male on the 13th and the female on the 6th of March.



## 10. CINNYRIS BALFOURI, sp. nov. (Plate XV. fig. 2.)

*Supra obscure cinerascens, fusco maculata; pileo parum obscuriore, indistinctius maculato; remigibus fuscis, in margine interno pallidioribus; subalaribus albido fuscoque variis; fasciculis pectoralibus late sulphureis; rectricibus obscure fuscis, extima albida, secundæ macula pogonii interni apicali magna alba; mento nigro; regione parotica infra albo marginata; gutture in fundo nigricante albo squamulato; abdomine sordide albido; subcaudalibus albidis; rostro nigro; pedibus obscuris. Long. tota 5·0, alæ 2·5, caudæ 2·0. Fem. vix diversa.*

Five males and two females of this new Sunbird are in the series. The species is remarkable for the entire absence of metallic colours in the plumage. Capt. Shelley, our best authority on this lovely group, writes to us, after examining the skins:—"The birds from Socotra are true Sunbirds, belonging to the genus *Cinnyris*. Presuming that they are in full plumage, I should refer them to my *Cyanomitra* or Olive Group (Monogr. Sunbirds, p. xxix), and place this species in my key directly after *C. obscura*, and in the same section 'a. No portion of the plumage metallic. Pectoral tufts yellow,' p. xxix. It is a very distinct species; and I should place it in a section by itself next to *C. obscura*, p. 291; but it has no very close affinities to that species."

"Common in the interior of the island, on the hill-slopes and higher plains, where there are plenty of shrubs. The female is difficult to get. The male clings to the topmost branches, whence he gives out a very pretty note."—I. B. B.

A nest of this species is in the collection (see Plate XV.). It is sewn on to a small pendent branch, and has a lateral opening half-way up. It is composed of woolly pappus of plants and dry tendrils, and is of the form usually met with in this group of birds.

## 11. PASSER INSULARIS, sp. nov. (Plate XVI.)

*Supra in fundo cinerascens maculis longitudinalibus nigris; fascia supraciliari postice dilatata dilute vulpino-rufa; regione parotica alba; oculo nigro circumdato; gula nigra; alæ tectricibus minoribus dilute rufis; remigibus tertiariis pallide rufescenti marginatis; remigibus primariis et rectricibus fuscis, his pallidius limbatis; subalaribus albido fuscoque variis; tergo, uropygio et supracaudalibus vix maculatis; subcaudalibus medio nigricantibus, late albido marginatis; subtus sordide et obsolete griseus, nonnihil fulvescenti lavatus; gutture plus minus nigro-maculato; rostro nigro, pedibus fuscis. Long. tota 5·7, alæ 2·9, caudæ 2·4, tarsi 0·8. Fem. omnino obsoletius tincta; gula et regione malari ex isabellino albidis; alarum tectricibus obsolete fusco-rufescentibus; remigibus tertiariis sordide fulvescenti limbatis; subtus unicolor griseus.*

There are eight specimens in the collection of this true Sparrow, which apparently cannot be associated with any of the described species. It comes very near to *Passer motitensis*, but differs in wanting

the rufous colour of the interscapulium and rump, these parts being of a sordid brownish ashy-grey; the tail, rufescent in *P. motitensis*, is dark fuscous in the Socotran species; and there are other minor differences.

"Common all over the island. In Goahal valley I found them, along with the next species, on a Euphorbiaceous shrub of the genus *Croton*."—I. B. B.

12. *RHYNCHOSTRUTHUS SOCOTRANUS*, gen. et sp. nov. (Plate XVII.)

Fig. 2.



Head, wing, and right foot of *Rhynchostruthus socotranus*.

*RHYNCHOSTRUTHUS*, gen. nov., ex fam. Fringillidarum.

Char. gen. Rostrum crassum, tumido-rotundatum, culmine distincto, tomis introrsum retractis, maxilla curvata, commissura curvata, gonyde conspicue adscendente; naribus in fossa basali positis, setis brevibus incumbentibus obtectis. Alæ longiusculæ, caudæ dimidium superantes, remigibus 1-3 cæteris longioribus, æqualibus, rem. 4to parum brevior. Cauda mediocris, æqualis. Pedes mediocres, satis debiles; digitus internus externo paulò brevior; ungues debiles.

*RHYNCHOSTRUTHUS SOCOTRANUS*, sp. nov.

*Supra obsolete fuscus, maculis obscurioribus conspicue varius, pileo subrufescente, obscurius maculato; remigibus tertariis in limbo externo dilute sulphureis; tectricibus alarum majoribus pallidore flavo marginalis; rectricibus, parte apicali excepta, in pogonio externo late flavo-limbatis, duabus intermediis subconcoloribus, limbo flavo vix conspicuo; remigibus majoribus fuscis; loris nigricantibus; regione parotica late stramineo-pallescente; gutture pallido, fuscescenti vario; pectore et abdomine in fundo sordide albido, obsolete fusco striolatis vel maculatis; crisso et subcaudalibus immaculatis; subalaribus sordide flavescenti-albidis, fusco variegatis; rostro plumbeo-nigricante, pedibus fuscis. Long. tota 5·7, alæ 3·3, caudæ 2·1, tarsi 0·7.*

Of this very curious new form of Sparrow four males are in the collection; unfortunately no female. The thick Coccothraustine bill renders it easily distinguishable from all other species of the Passerine group.

"On the shrubs in the Goehel valley; feeding on seeds of a species of *Croton*."—*I. B. B.*

13. *EMBERIZA SEPTEM-STRIATA* (Rüpp.).

*Emberiza tahapisi*, Heuglin, Orn. N.A. ii. p. 665.

One example, apparently of this species, in spirits.

"Met with in several places, hopping about on the stones in the streams."—*I. B. B.*

14. *AMYDRUS BLYTHI*, Sel.

*Amydrus blythi*, Heuglin, Orn. N.A. ii. p. 525.

Five males and six females of this fine species; hitherto only known from Somali-land.

"Voice as fine as that of a Thrush. Scarce on the low grounds, and there usually in pairs, except where there are groves of fig-trees or tamarinds on the banks of the streams, as at Feraigeh on the south, and Ma-über on the north.

"Common on the high grounds in flocks, and there seen on the faces of the cliffs in which they nest. Nom. vulg. 'Shilhay.'"—*I. B. B.*

15. *AMYDRUS FRATER*, sp. nov.

*Æneo-niger, cauda subrotundata; rostro pro mole longiore quam in A. blythi; remigibus primariis cinnamomeo-rufis, parte apicali nigra valde extensa, in rem. 1 et 2 vix diversa ab A. blythi, in rem. 3 et 4 multo minore et æquali modo extensa. Long. tota 12·0, alæ 6·0, caudæ 5·5, tarsi 1·4.*

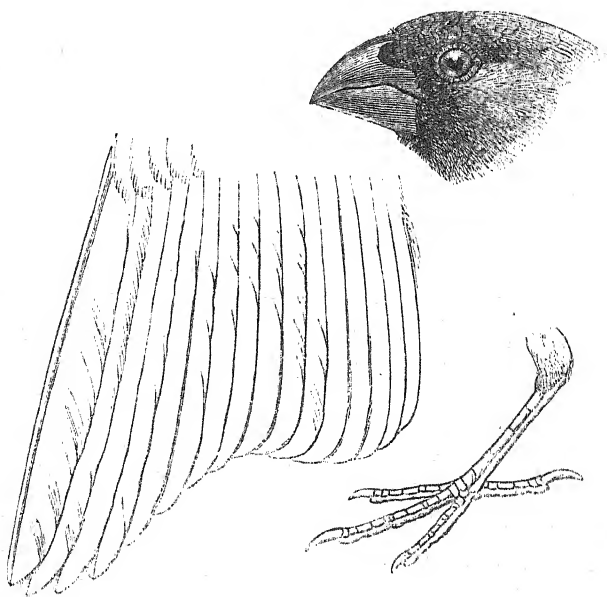
The occurrence of two typical species of *Amydrus* in so small an island as Socotra is very curious; but there seems to be no doubt about the fact. The bronze-green gloss of the plumage of *A. frater* is never seen in the steel-blue of *A. blythi*; and still greater is the difference in the colouring of the primaries. In the first primary of *A. frater* the black apical portion occupies nearly the

the rufous colour of the interscapulum and rump, these parts being of a sordid brownish ashy-grey; the tail, rufescent in *P. motitensis*, is dark fuscous in the Socotran species; and there are other minor differences.

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*RYNCHOSTRUTHUS SOCOTRANUS*, sp. nov.

*Supra obsolete fuscus, maculis obscurioribus conspicue varius, pileo subrufescente, obscurius maculato; remigibus tertiariis in limbo externo dilute sulphureis; tectricibus alarum majoribus pallidior flavo marginatis; rectricibus, parte apicali excepta, in pogonio externo læte flavo-limbatis, duabus intermediis subconcoloribus, limbo flavo vix conspicuo; remigibus majoribus fuscis; loris nigricantibus; regione parotica late stramineo-pallescente; gutture pallido, fuscescenti vario; pectore et abdomine in fundo sordide albido, obsolete fusco striolatis vel maculatis; crisso et subcaudalibus immaculatis; subalaribus sordide flavescenti-albidis, fusco variegatis; rostro plumbeo-nigricante, pedibus fuscis. Long. tota 5·7, alæ 3·3, caudæ 2·1, tarsi 0·7.*

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half of the whole length, and almost as much in the second; in the two following this black portion is much smaller and of equal length. All this is widely different in *A. blythi*. Another difference between the two *Amydri* of Socotra is a structural one: in *A. blythi* the tail is cuneate, the median rectrices being much elongated; in *A. frater* it is a little rounded and much shorter.

Only one specimen, an adult male, shot on February 28th. Prof. Balfour did not distinguish this bird from *A. blythi*.

#### 16. CORVUS UMBRINUS, Hedenb.

*Corvus umbrinus*, Heuglin, Orn. N.A. ii. p. 505.

Two examples.

"About the centre of the island, common. None about Gollonsir or at the extreme east. Very fearless, and not particular as to the nature of the carrion. The Vultures always yield to them. Nom. vulg. 'Aādip.'"—*I. B. B.*

#### 17. PYRRHULAUDA MELANAUCHEN (Cab.).

*Coraphites melanauchen*, Heugl. Orn. N.A. ii. p. 672.

Five males and four females of this Abyssinian species, which extends far into Western Asia, and was obtained by Mr. Blanford in Scinde in January 1876.

"Very common on the low-lying plains on both sides of the island. Has a long wailing note, which one hears at daybreak, and the last sound at sunset."—*I. B. B.*

### ii. PICARIÆ.

#### 18. CENTROPUS SUPERCILIOSUS, H. et Ehr.

*Centropus superciliosus*, Heugl. Orn. N.A. ii. p. 797.

A pair of this species.

"By no means common. One bird shot by Cockburn on the limestone plain around Hadibu, close to the stream, sitting on top of a date-palm; the other I obtained on the bank of a stream between the Hadibu plain and Delishi, just at the back of Ras Haulaf. The bird was in the water when I came up; I did not see any except the two specimens."—*I. B. B.*

### iii. ACCIPITRES.

#### 19. NEOPHRON PERCNOPTERUS (Linn.).

"Everywhere on the island."—*I. B. B.*

#### 20. FALCO PEREGRINUS, Tunst.

"By no means common. I only saw three individuals—one on the granite hills near the village of Kismaha, another near the eastern extremity of the island, and a third (the one skinned) from the granite hills above Hadibu."—*I. B. B.*

## 21. TINNUNCULUS ALAUDARIUS (Gm.).

"This bird was shot by Cockburn on the Shaeb plain; I only saw one other, on the plain about Gollonsir."—*I. B. B.*

## iv. HERODIONES.

## 22. ARDEA GULARIS, Bosc.

*Ardea gularis*, Heuglin, Orn. N.A. ii. p. 1059.

"Common on the margins of the shoals near the mouths of the streams."—*I. B. B.*

Only wings of this bird were brought home; but we think there is no doubt about the species.

## 23. PLATALEA LEUCERODIA (Linn.).

*Platalea leuceroia*, Heuglin, Orn. N.A. ii. p. 1122.

"On the margins of stagnant pools in vicinity of villages on coast. This specimen was shot at Cadhoop. There are no villages on the south side of island."—*I. B. B.*

## v. ANSERES.

## 24. QUERQUEDULA CRECCA (Linn.).

"Specially prevalent on the Debeni river and Khorfariah. Some were also seen on the river at Gollonsir. I have seen as many as fourteen in a flock."—*I. B. B.*

## vi. COLUMBÆ.

## 25. TRERON WAALIA (Gm.).

*Treron walia*, Heugl. Orn. N.A. ii. p. 817.

"Most common about Feraigh in the date-palm grooves. I did see a few on the north side of the island near Kismaha. Nom. vulg. "Mahabîdat."—*I. B. B.*

## 26. TURTUR SENEGALENSIS (Linn.).

*Turtur senegalensis*, Heuglin, Orn. N.A. ii. p. 841.

"Very common in all the date-palm groves and also amongst the shrubs on the lower part of the hills."—*I. B. B.*

## vii. GALLINÆ.

## 27. COTURNIX COMMUNIS, Bonn.

"On the plains at the east end of island I saw a brace of Quails, of which one was obtained. Again, on the Hajad plain I saw a brace, and on the Haggier ridge I saw one or two; but they were not very common."—*I. B. B.*

## viii. LIMICOLÆ.

## 28. CURSORIUS GALLICUS (Gm.).

"I only saw three of these birds on Cadhoop plain, and obtained one."—*I. B. B.*

29. *ÆGIALITIS CURONICA* (Beseke).

"Common on the streams."—*I. B. B.*

30. *ÆGIALITIS CANTIANA* (Lath.).

"Common on the streams."—*I. B. B.*

31. *TOTANUS CANESCENS* (Gm.).

"Abundant on the Deheni river."—*I. B. B.*

32. *TRINGOIDES HYPOLEUCUS* (Linn.).

"Met with on the upper part of the stream in Gollonsir valley."  
—*I. B. B.*

33. *GALLINAGO GALLINAGO* (Linn.).

One example of this species, preserved in spirit, is in the collection.

"Often seen in the marshes at the mouths of the rivers."—*I. B. B.*

34. *DROMAS ARDEOLA*, Payk.

"This bird was met with on the shore at the mouth of the river at Gollonsir, where it was frequent."—*I. B. B.*

## ix. GAVIÆ.

35. *LARUS AFFINIS*, Reinhardt.

*Larus affinis*, Saunders, P. Z. S. 1878, p. 171.

"Common on the shore in the vicinity of 'Cadhoop' village. I did not see them either near Gollonsir village or near Hadibu."—*I. B. B.*

Mr. Howard Saunders has kindly taken considerable trouble with the single specimen of this Gull obtained. It is in immature plumage, "an unusually large specimen, but not of *L. murinus*, as a casual observer might suppose."

36. *STERNA BERGII* (Licht.).

*Sterna bergii*, Heuglin, Orn. N.A. ii. p. 1436.

"On shores at Cadhoop and between that village and Hadibu. Common."—*I. B. B.*

## CONCLUSIONS AS TO THE SOCOTRAN AVIFAUNA.

The examination of the collection shows at once that, so far as one can judge of it by its birds, Socotra, as might have been anticipated, belongs to the same fauna as North-eastern Africa. The island has, however, been sufficiently long separated from Cape Gardafui to allow of a certain number of species becoming differentiated, unless indeed, as is not improbable, these shall be hereafter found to exist also in Somaliland, the ornithology of which is still very imperfectly known to us.

Putting aside all the birds in the previous list, except the Passeres,



Picariæ, and Columbæ, as being of wide distribution, we find that out of the twenty birds of these three orders, all but seven are mentioned in Heuglin's 'Ornithologie Nordost-Africa's.' Of these seven, six, as far as is at present known, are new species peculiar to the island; but one is a Western Asiatic species, although very closely allied to a prevailing North-east African form. Of the six new species, one seems to be generically distinct from any thing yet known, though our impression is that *Rhynchostruthus* will yet be found on Cape Gardafui. The remaining five all belong to prevailing North-east African genera.

2. On the Lepidoptera collected in Socotra by Prof. I. B. Balfour. By ARTHUR G. BUTLER, F.L.S. F.Z.S. &c.

[Received January 15, 1881.]

(Plate XVIII.)

The Lepidoptera collected by Professor Balfour consist of 24 specimens referable to 13 species, of which 11 are Rhopalocera; 7 of the species are new to science.

Of the known forms in this series one is cosmopolitan, two are found in Europe, Asia, and Africa, one throughout Africa, one in S.W. Africa and Abyssinia, and one (with trifling differences) in South Africa. Of the new forms five are allied to previously recorded types from the following localities—one from the Comoro Islands, one from S.W. Africa, one from Zanzibar, and two from Arabia. Without the help of these last two, it would therefore be impossible for any one not acquainted with it to guess at the locality from which this collection had been obtained.

The following is a list of the species:—

RHOPALOCERA.

NYMPHALIDÆ.

DANAIS CHRYSIPPUS (No. 706).

*Papilio chrysippus*, Linnæus, Mus. Lud. Ulr. p. 263 (1764).

A single female specimen of this widely distributed species was obtained.

CALYSISME SOCOTRANA, sp. n. (Plate XVIII. fig. 7.)

(♂ No. 731, ♀ 716.)

Nearest to *C. anynana* from Johanna (Comoro group). Olive-brown; wings above with paler outer border traversed by a wavy submarginal brown line; a black marginal line; fringe slightly darker than the outer border: primaries crossed beyond the cell from costa to first median branch by a slightly undulated pale-bordered dusky line; two ocelli of the ordinary type, one towards apex about a quarter the size (*i. e.* half the diameter) of the other, which is placed on

the first median interspace: secondaries with a scarcely perceptible small blind ocellus on the first median interspace. Wings below paler, transversely striated with darker lines, the disk (particularly in the female) suffused with lilacine grey, the ocelli with pale zones, and in the male<sup>1</sup> with whitish instead of orange irides, those of the primaries situated as on the upper surface, but the subapical one, particularly in the female, greatly reduced in size; the outer border with sharply defined zigzag inner edge towards apex, in the female suffused with ferruginous, the intersecting submarginal line being dark ferruginous; a broad central belt, the inner edge of which is obsolete in the male but sharply defined by a white-bordered ferruginous line in the female; the outer edge slightly undulated and angulated on all the wings, dark brown with pale border in the male, ferruginous with white border in the female; secondaries with seven discal ocelli, of which the second, third, and seventh are very small and the fifth the largest. Expanse of wings, ♂ 1 inch 6 lines, ♀ 1 inch 9 lines.

Two worn males and one fresh female were obtained.

CHARAXES BALFOURI, sp. n. (Plate XVIII. fig. 6.)

(No. 741.)

Allied to *C. varanes*, from which it differs as follows:—The outer margins of all the wings dentated at the extremities of all the veins, that of the secondaries with *two tails* of the ordinary type, that at the end of the first median branch being rather short (3 to 4 millimetres), and that at the end of the third branch of about double the length, more slender and *gradually tapering towards the point*: wings above deep mahogany red, rather paler on the basal half; primaries with all the markings as in *C. varanes*, excepting that the spots beyond the cell are not so black: secondaries with the rounded black spots only distinct towards the apex; *outer border black with a marginal series of pale blue lunules fringed with snow-white*. *Body laky brown*, prothorax and head olivaceous. Under surface of wings very like *C. varanes*, but the general colour greener, most like that of the darkest Natal specimens, the black characters on the basal area better marked, the white stripe limiting the broad basal area wider, more diffused externally, and *distinctly angulated* on all the wings: the ocelli on the secondaries slightly narrower, and the outer margin of these wings bordered with *a series of large black and white lunules*. Expanse of wings 3 inches 8 lines.

One specimen of this extremely interesting species was captured.

The allied species *C. varanes* has hitherto been referred to the genus *Philognoma* on account of its only having one peculiarly shaped tail to the secondaries; but the arrival of this form from Socotra necessitates its transfer to *Charaxes*, since we now possess a species with the structure of the latter genus, and the general character of the supposed *Philognoma*.

<sup>1</sup> Possibly owing to fading.

## PYRAMEIS CARDUI.

*Papilio cardui*, Linnæus, Fauna Suecica, p. 276, n. 1054 (1761).

A fragment of this cosmopolitan species.

## ACRÆA NEOBULE. (Plate XVIII. fig. 5.)

*Acræa neobule*, Doubleday & Hewitson, Gen. Diurn. Lep. pl. 19. fig. 3 (1848).

(No. 746.)

One female of this species was caught; it differs from specimens which I have examined from the Congo and Abyssinia in the greater size of all the black spots on its wings, and in having the base of the secondaries black spotted with red, owing to the confluence of the black markings. These differences, however, may be due to simple variation; and therefore it would not be safe, with only one specimen, to regard them as specific characters.

## HYPANIS CORA. (Plate XVIII. fig. 4.)

*Hypanis cora*, Feisthamel, Ann. Soc. Ent. France, 1850, p. 249.

(No. 726.)

A pair of this species, only differing from South-African specimens in the slightly wider red-brown belts on the under surface of the secondaries and the consequently narrower bands of white spots. It would be impossible to decide from a single pair whether these apparently trivial distinctions are constant and confined to the island whence the specimens were obtained.

## PAPILIONIDÆ.

## TERACOLUS NIVEUS, sp. n. (Plate XVIII. fig. 1.)

(♀ No. 721.)

♂. Nearest to *T. evagore*, *demagore*, and *liagore*, but differing from all in the considerably smaller extent of the orange apical patch on the primaries. Wings above snow-white; primaries above with a narrow triangular orange apical patch from costa to third median branch, bounded externally by five hastate black spots and in front by an abbreviated black costal line: body black, thorax clothed with silvery hairs, abdomen cream-coloured at the sides. Under surface white, each wing with a small black dot at the end of the cell, primaries indistinctly showing the orange of the upper surface through their texture; secondaries with a greyish costal spot, and one or two dots of the same colour on the disk beyond the cell, basi-abdominal area slightly speckled with black. Expanse of wings 1 inch 5 lines.

♀. Snow-white, base speckled with blackish: primaries above with a dot at the end of the cell, four spots in an oblique series, more than halfway between the cell and apex, and four or five squamose marginal spots between the apex and the third median branch, black; secondaries with four decreasing marginal black spots between the apex and the second median branch: body blackish, clothed with

white hairs, but rather paler than in the male. Primaries below white, a black dot at the end of the cell; four brownish spots in an oblique series limiting the inner edge of the apical area, which is cream-coloured and speckled with grey: secondaries cream-coloured, speckled with grey; a black dot at the end of the cell; an angulated series of seven more or less distinct brownish spots across the disk: body snow-white. Expanse of wings 1 inch 4 lines.

One pair of this pretty little species was obtained.

*TERACOLUS CANDIDUS*, sp. n. (Plate XVIII. fig. 2.)

(♂ No. 701, ♀ 736.)

♂. Allied to the preceding, but smaller; the primaries with an oblique subapical orange patch, five pyriform marginal black spots; secondaries with two apical marginal black dots: below much as in *T. niveus*. Expanse of wings 1 inch 2 lines.

♀. Chiefly differs from the preceding in its smaller size and less pronounced markings. Expanse of wings 1 inch 2 lines.

Three males and one female obtained. I think it may prove to be a variety of the preceding species, although the difference in the coloration at the apex of the primaries in the male is very remarkable.

*CATOPSILIA PYRENE* (No. 711).

*Colias pyrene*, Swainson, Zool. Ill. i. pl. li. (1820-21).

One male specimen.

*SYNCHLOË ANOMALA*, sp. n. (Plate XVIII. fig. 3.)

(No. 761.)

♀. Most like *S. protodice* of North America, but larger than any species of the group. Wings above white, speckled with black scales at the base: primaries with the costal border to the end of the cell heavily black-speckled; a large subquadrate black spot on the discocellulars; a very irregular black discal band formed of large oblong spots alternating with lunules, only separated from a rather broad external border by a series of six unequal white spots; this border is broad at apex, and gradually tapers to the external angle: secondaries with angular submarginal series of five black spots (the first on costal border large and quadrate), separated from a tapering brown border by spots of the ground-colour as in the primaries: body above blackish, clothed with silky grey hairs; prothorax clothed in front with short brown hair; palpi white, with brown edges; antennæ pale brown. Under surface white, broadly but sparsely speckled with black scales towards the base: primaries with the discocellular spot, discal band, and dusky basal half of costa as above; outer border obsolete, this part of the wing being, however, apparently greyish owing to its semitransparency, and slightly shot with pink: secondaries with slight pink reflections; the markings of the upper surface only indistinctly visible through the texture of the wing: body below white. Expanse of wings 2 inches 6 lines.

One rather worn female.

The species is of the size and general form of *Belenois abyssinica*; but its pattern and coloration seem to ally it to the species of *Synchlœ*; the possession of a male specimen would satisfactorily decide whether or not it is an unusually aberrant *Belenois*.

#### HESPERIIDÆ.

HESPERIA JUCUNDA, sp. n. (Plate XVIII. fig. 8.)

(Nos. 751 ♂, 766 ♀.)

Dull blackish-brown: primaries shot with shining green and bronzy brown towards the base; edge of costal margin yellow towards the base, but white towards the apex; fringe of outer margin snow-white: secondaries with costal border and anal angle velvety black; the hairy clothing of the basal area greenish grey, of the abdominal fold pale testaceous; a patch of ochreous hair just above the anal angle; fringe with an ochreous basal line, externally snow-white to the first median branch, where it changes to bright reddish orange: head and thorax very dark green; the palpi (excepting their terminal joint and external margin, which are velvety black), a spot at the base of each antenna, and the back of the head bright reddish orange; abdomen dull black, with greyish hind margins to the segments, anus surrounded by reddish-orange hairs. Wings below greyish brown: primaries with a large diffused purplish-black basal patch; costal margin orange towards the base, but afterwards white; an abbreviated line on the submedian vein, a second on the inner margin, and the fringe white: secondaries with the fringe as above; a triangular spot within the end of the cell, a large elongated patch enclosing a black spot on the interno-median interspace, and an interrupted squamose streak running upwards towards the apex from its external extremity orange; a circular spot near the outer margin on the interno-median interspace, and a second at anal angle confluent with the fringe, reddish orange: pectus blackish; femora and tibiæ streaked with pale buff and clothed with long reddish-orange hairs, venter black at the sides, with two or three small orange dots; a broad central longitudinal reddish-orange stripe. Expanse of wings, ♂ 2 inches 6 lines, ♀ 2 inches 9 lines.

Three males and one female.

The female specimen is rather paler than the male; but this may be partly due to fading. The species comes nearest to *H. taranis*.

#### HETEROCERA.

##### LITHOSIIDÆ.

DEIOPEIA PULCHELLA (No. 756).

*Tinea pulchella*, Linnæus, Syst. Nat. i. 2, p. 884, no. 349 (1766).

Two examples, one of which has the scarlet markings on the primaries larger than usual.

## HYDROCAMPIDÆ.

## OLIGOSTIGMA INCOMMODA, sp. n. (No. 540).

Nearest to *O. curvifera* of North America. Snow-white: the primaries above crossed near the base by an angular brownish band (probably pale orange with black margins in fresh examples); second band pale orange with black margins, beginning beyond the cell in the form of a 3, the lower extremity of which is carried below the median vein to the origin of the first branch, where it turns off at an angle, and runs transversely to the inner margin; a black-edged transverse pale-orange spot closing the cell; a blackish-edged pale orange sinuated submarginal band; outer border apparently pale orange, edged internally with black scales: secondaries crossed near the base and at the middle by bands of black scales; an irregular black-edged orange discal band, its outer margin zigzag; outer border pale orange, edged internally with black. Under surface uniform snow-white. Expanse of wings 9 lines.

One female specimen so much rubbed that only familiarity with the genus enables one to trace the direction of the bands on the primaries.

## EXPLANATION OF PLATE XVIII.

- Fig. 1. *Teracolus niveus*, ♂ and ♀ (upperside), p. 177.  
 2. *Teracolus candidus* (upperside), p. 178.  
 3. *Synchlœ anomala* (both surfaces), p. 178.  
 4. *Hypanis cora* (underside), p. 177.  
 5. *Acœa neobule* (underside), p. 177.  
 6. *Charaxes balfourii* (both surfaces), p. 176.  
 7. *Calsisme socotrana* (both surfaces), p. 175.  
 8. *Hesperia jucunda* (both surfaces), p. 179.

3. On some Points in the Anatomy of the Koala (*Phascolarctos cinereus*). By W. A. FORBES, B.A., F.L.S., F.Z.S., Prosecutor to the Society.

[Received January 17, 1881.]

On April 28th of last year (1880), as already recorded in the Society's Proceedings<sup>1</sup>, the Society purchased for its collection the first living Koala (*Phascolarctos cinereus*) ever brought to Europe. The animal, a young female, continued to do well and thrive after its arrival at the Gardens, and on a diet of fresh *Eucalyptus*-leaves, which were substituted after a while for the dried ones on which it had been kept alive during the voyage and the first part of its stay in this country, became daily in better condition and more active. Being a pet animal, accustomed to being caressed, it was thought better not to put it in a cage; so a room for its use was fitted up in the Superintendent's office. Here, under the charge of a special at-

<sup>1</sup> P. Z. S. 1880, p. 355; where a woodcut of it, from the pencil of Mr. Wood, is given.

tendant, it slept, perched upon the branches of a tree erected for its use, by day, whilst at night it wandered about the room. Very unfortunately, on the night of the 14th of June it was accidentally killed, whilst thus roaming about at night, by getting caught between the top and bottom of a fixed washing-stand, which had been allowed to remain in the room. It had apparently climbed up this and brought down on its neck the heavy lid. Nobody being near, and in spite of evidently determined struggles on its own part, it failed to relieve itself, and so was found dead in the morning from asphyxia.

The death of this animal, so unfortunate for visitors to the Society's Gardens, has given me the opportunity of putting on record some additional facts concerning the anatomy of the soft parts of this species. Mr. W. Martin, in this Society's 'Proceedings' for 1836<sup>1</sup>, has described already some of the most striking features of the animal's organization; and in Prof. Owen's 'Anatomy of Vertebrates' (vol. iii.) a few additional facts concerning it are also recorded. More recently Mr. A. H. Young has described and figured the male reproductive organs (Journ. Anat. Phys. xiii. pp. 305-317, pl. xviii.). All these anatomists, however, had only spirit-preserved specimens to work on; a few additional observations from the fresh specimen may therefore be worth putting on record, and the liver, brain, and female reproductive organs described in particular, these important parts of the system having been only imperfectly, or not at all, described by my predecessors in this field.

The following dimensions were taken on the body of the animal:—

	inches.	millim.
Total length, from tip of nose to end of body ..	17·0	432
Length of eye .....	1·0	25
„ ear (greatest) .....	2·15	55
„ head ..	4·0	100
„ nude muzzle .....	1·4	35
„ chin .....	2·65	67
Breadth across muzzle .....	1·0	25
„ of mouth .....	1·3	33
Distance between cloaca and mammæ .....	1·25	32

The tail is a mere stump above the cloaca, which latter is well defined by a well-marked circular marginal fold of the integuments. The hallux has no trace of a thumb. The skin is generally flesh-coloured; but the soles of the manus and pes, together with the naked "muffle," are black. The skin of the large and hairy ears is flesh-coloured. There is a narrow naked ring round the eyes; and the irides are brown. The pupil is a vertical oval. The nostrils are transversely oblique, the nasal septum measuring  $3\frac{1}{2}$  millims. The upper lip is split; but the split does not quite, when the surrounding parts are expanded, reach the nostrils. The skin is sparsely covered with hairs between the rami of the mandible; for nearly two inches behind it the skin is absolutely naked; and on the sides (running

<sup>1</sup> P. Z. S. 1836, pp. 109-113.

up towards the angle of the mouth) it is nearly so, a patch of black hairs being developed just behind the mouth on the lower and outer surface of this bare space.

The marsupial pouch in this young specimen is very imperfectly developed. It appears as a small, oval, nearly naked space, measuring about 0·8 inch both across and antero-posteriorly, with a well-marked bounding-fold of integument on each side; inside which is a smaller, secondary one. The hairs of the surrounding parts more or less radiate from this nude space, which lies between the epipubes (or so-called "marsupial bones"). The skin covering it is pinkish. The teats are two<sup>1</sup> in number, 15 millims. apart, and are situated at the posterior and inner angles of the bounding-folds; they are covered by fur. The lips of the pouch, it may be noted, look as much downwards as forwards.

In an adult ♀ Koala, 20½ inches long, preserved in spirit, the pouch is much better developed—its antero-posterior extent being about 1·85 inch, whilst the breadth of the aperture is 1·4 inch. It admits (my) three median fingers, and extends widely outwards into the groins, as far as the skin-fold between the knee and trunk. The teats, two in number, are situated behind, on a level with the posterior margin of the pouch's mouth. The skin lining the pouch, except just around the ventral opening of the pouch, is smooth throughout.

The mucous membrane of the cheeks is smooth throughout; the skin is attached to the gum opposite the first palatal ridge, and again opposite the posterior border of the first premolar. Between these two attachments there is formed a sort of cheek-pouch, defined by a distinct sphincter, and capable of receiving the end of the little finger. This pouch extends upwards on the side of the skull, occupying the somewhat oval space that exists, in the macerated skull, in front of the zygoma; it is lined by smooth, white, mucous membrane<sup>2</sup>.

The palate presents 9 irregular raised ridges, best marked anteriorly. There is no uvula, and the narrow fauces are smooth. The tongue quite fills up the space between the gums. It is parallel-sided and elongated, but rounded off and thinner in front. It has a single, small, circumvallate papilla behind; the fungiform papillæ are distributed chiefly along the sides of the upper surface.

The salivary glands are well developed. The sublingual (which is not mentioned by Martin in his description) is a long, narrow, and thin gland, somewhat foliaceous at the extremity, and about 2·7 inches in extent, lying deeply along the inner margin of the lower jaw. The long duct of the submaxillary gland pierces it. I could find no subzygomatic gland, as described by him (*l. c.* p. 112).

On opening the abdominal cavity the stomach is visible in the

<sup>1</sup> Prof. Owen (*Anat. Vert.* iii. p. 769) describes *Phascogale* as having four ["two on each side"] mammary glands.

<sup>2</sup> These pouches are also, I find, described by Owen (*Anat. Vert.* iii. p. 385). They also exist, though less well defined by a sphincter, in the Wombat; but I cannot find them in the other *Phalangers* I have examined.



epigastric and left hypochondriac regions, the pylorus being directed towards the right side; and it is there in contact with the gall-bladder. The liver does not appear. The commencement of the transverse colon is visible, running downwards towards the left, below, but parallel with, the greater curvature of the stomach. The great omentum is attached to the transverse colon in the right hypochondrium, and does not cover the mass of the viscera. The greater part of the rest of the abdominal cavity is occupied by the great, longitudinally plicated, folds of the cæcum and cæcum-like ascending colon, a few folds of the small intestine appearing between the transverse colon and a great fold, apparently the cæcum, which runs transversely across the middle of the abdominal cavity. On turning back these great superficial folds the end of the cæcum is seen passing downwards to the left of the rectum, behind the uteri and bladder, to terminate, deep in the pelvic cavity, close to the cloaca! The descending colon, which is narrow and of the ordinary appearance, is very long, and is arranged on a broad mesocolon to the right of the vertebral column, forming here a series of loose loops, which, however, are not closely coiled together on each other as in Ruminants. The right kidney lies superficially to the liver. The duodenal loop passes downwards and to the right, and overlies the right kidney, but passes under the ascending colon just here.

The stomach is cylindrical and sac-like. Its length, moderately distended, is about  $3\frac{1}{4}$  inches; its greatest depth, opposite the pyloric constriction,  $1\frac{1}{2}$  inch. There is a well-marked cardiac fundus to the left of the œsophagus, and the pyloric part is slightly bent on the cardiac part; this latter is marked off internally by a distinct fold of the mucous membrane, which is smooth and pale, with some slight traces of rugæ in the cardiac fundus.

The most marked peculiarity of the Koala's stomach is its possession, as is well known, of a special gland-patch, similar to that found in the Beaver<sup>1</sup> and Wombat<sup>2</sup>. This gland-patch forms a slight elevation externally on the lesser curvature of the stomach, just on the pyloric side of the entrance of the œsophagus. It is somewhat saddle-shaped, with a transverse extent of 1.4 inch. Internally it forms an eminence about the size of a florin, which includes the entrance of the œsophagus. The mucous membrane on the gland-patch, around the entrance of the œsophagus, is red and vascular; elsewhere in the stomach, as already stated, it is quite pale. The openings of the gland-patch are about 30 in number, of varying sizes, and irregularly arranged over the eminence. Some of the openings of the gland are complicated, several smaller openings debouching into a larger one; and the area occupied by the openings is not symmetrical. The general appearance of this patch is well represented by Sir Everard Home's figure (*l. c.*) of that of the Wombat. In this latter animal the general structure and form of the stomach are also very like that here described; but it is more

<sup>1</sup> Cf. Owen, *Anat. Vert.* iii. p. 422.

<sup>2</sup> Home, *Phil. Trans.* 1808, p. 307, pl. ix.

globular, and therefore less cylindrical in shape, the cardiac and pyloric openings being more approximated.

The small intestine is villous, but otherwise smooth. It is not sacculated, and when spread out, after being cut, is 0·5 inch across. At its commencement it is dilated for about two inches; there are no Peyer's patches; its length is 115 inches. The large intestine is very peculiar: for the first  $28\frac{1}{2}$  inches or so of its length, which forms the ascending colon, it is very capacious, and internally longitudinally corrugated, like the cæcum, which externally it much resembles, the rugæ of the interior appearing through the walls of the intestine, and giving it a longitudinally striated appearance. These folds of the mucous membrane, which might be called longitudinal *valvulæ conniventes*, where best developed are about 2 inch in depth; they are arranged longitudinally and are roughly parallel, though somewhat irregular in extent; they are separated from each other by intervals of about the same extent (0·2 inch). At the commencement of the colon, which here, when cut open and spread out, is 3·75 inches broad, and of the cæcum, there are about a dozen of these folds very well marked. These continue throughout the ascending, cæcum-like, colon; but where it narrows to form the transverse and descending parts they converge, and become more or less blended with each other, forming linear elevations. They are continued downwards as far as the rectum, but are reduced by that time to five<sup>1</sup>. In the cæcum, which is also very capacious, the same arrangement of folds obtains till within 18 inches of its apex, when they gradually disappear, the rest of the organ being thence onwards quite smooth internally. The cæcum, the curious position of the *caput* of which has already been described, measures 46·75 inches in length (nearly three times the length of the animal's body!); the large intestine 93·25 inches. In an adult female ( $20\frac{1}{2}$  inches long), preserved in spirit, the following were the intestinal measurements:—

	inches.
Small intestine . . . . .	111·15
Large „ . . . . .	160·8
Cæcum . . . . .	66·0

Owen (Anat. Vert. iii. p. 420) gives 92, 125, and 77 inches respectively. On each side at the junction of the ileum and colon is a small patch of three glands.

The liver of the Koala is of very remarkable form. It is repre-

<sup>1</sup> Mr. Martin describes (*l. c.* p. 111) both colon and cæcum as sacculated “by a slight longitudinal (mesenteric) band of muscular fibres,” with indications of a similar opposite band. I could find no traces of any such sacculation in the fresh Koala examined by me; nor are they mentioned by Prof. Owen (Anat. Vert. iii. p. 418). It is also to be noticed that Martin does not in any way allude to the existence of the very remarkable folds of the interior of the cæcum and colon.

In *Phalangista* and *Phascolomys* an examination of fresh specimens has completely failed to exhibit any traces in either cæcum or colon of the longitudinal folds here described. In the latter genus the colon is capacious at its commencement, and sacculated transversely, in a way that does not obtain in either *Phalangista* or *Phascolarctos*.

sented, drawn to scale of  $\frac{3}{8}$  the natural size, in the accompanying figures (1 and 2, pp. 186, 187). All four principal lobes are well developed; but those on the right are far larger than those on the left, the left central being considerably the smallest of these. The umbilical fissure is distinct, extending about halfway across the liver. The right central lobe, which is broad transversely, and forms the largest lobe, is divided very deeply by the large cystic fissure, which extends on the thoracic surface nearly as far back as the umbilical one, and allows the very large and elongated gall-bladder to appear above. Both right and left lateral fissures are also (in this specimen) well developed. The right lateral lobe is large and somewhat oval in shape, but pointed below. The caudate is not present as a free structure, but it is represented by a somewhat squared, diagonally ridged elevation, lying to the right of the inferior *cava*, and broadly attached to the substance of the right lateral lobe. The lower border of this elevation is slightly excavated to receive the corresponding kidney. The Spigelian is represented by a smaller thickening, ending in a pointed and free apex, and lying to the left of the *vena cava*; it is united over this by hepatic tissue to the caudate. This liver is further remarkable for the great tendency it has to subdivision, numerous fissures, of varying sizes and depths, being developed along the margin of the chief lobes. Their position and relative size will be better understood from the figures than from any verbal description. They are more conspicuous on the visceral than the thoracic surface. The right half of the right central lobe has one such notch on its right external border; the other half 3, on the right internal border; the left central has 4, the left lateral 3, whilst the right lateral is still more cut up by about 10. Finally, the caudate has 3 of these supplementary fissures.

The gall-bladder is remarkably long, projecting far beyond the anterior margin of the liver, and, as already described, appearing superficially. It is  $2\frac{3}{4}$  inches long from its apex to the commencement of its duct opposite the anterior margin of the left central lobe. The free part is connected by a peritoneal investment to the sides of the cystic fissure.

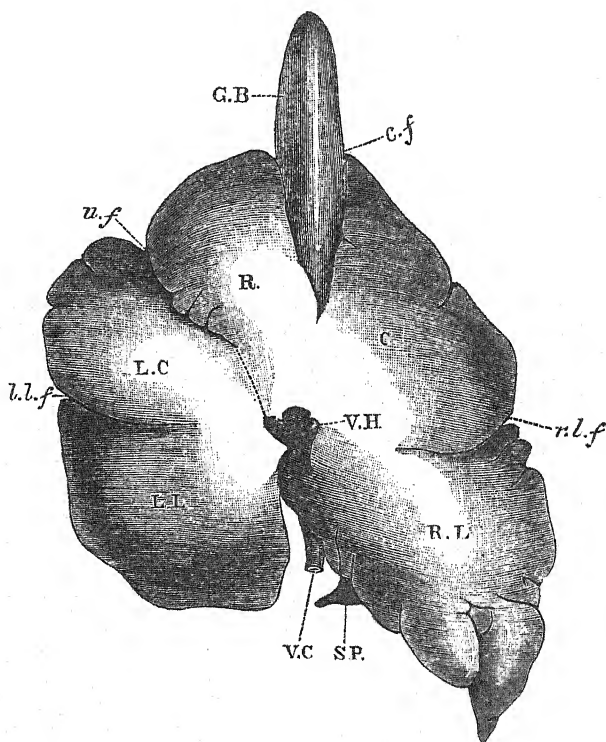
In a second liver of *Phascolarctos* examined (which, however, having been extracted from a spirit-preserved animal, an adult ♀, is not so well preserved as might be wished) the same general features obtain. The left lateral fissure, however, is less distinct, as is the caudate; and the left central lobe is smaller proportionally to the left lateral. The Spigelian wants the pointed apex; and the development of secondary fissures seems to attain an even greater extent<sup>1</sup>.

<sup>1</sup> In *Phalangista vulpina* the right central lobe is also, as in the Koala, the biggest, and very deeply divided by a cystic fissure. The gall-bladder, however, does not nearly reach the margin of the liver; the left lateral lobe is much bigger than the right lateral, which is as large as the left central; the caudate is quite free and narrow. All the lobes are remarkably distinct; and their margins are quite simple, with no trace of any such fissures as obtain in the Koala.

The liver of *Cuscus maculatus* is formed on a similar principle, though the right central lobe is not bigger than the left lateral, and the gall-bladder reaches to the liver-margin. All the lobes are simple. The caudate and Spigelian,

The bile- and pancreatic ducts open into the duodenum  $2\frac{1}{2}$  inches from the pylorus. The pancreatic duct is dilated terminally into a vesicle, which does not receive the bile-duct, the latter opening alongside the former into the intestine.

Fig. 1.



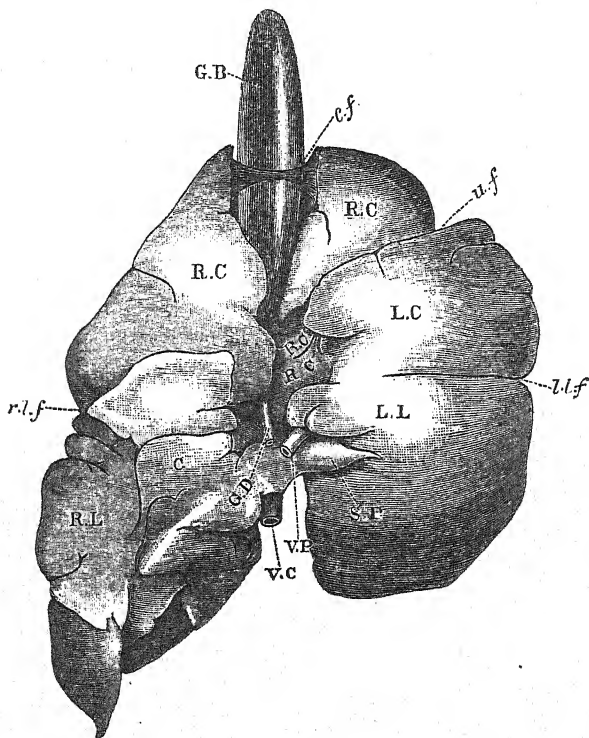
Liver of Koala, from above; three fifths the natural size.

though small, are quite distinct. The livers of *Belideus sciureus* and *B. breviceps*, *Acrobata pygmaea*, and *Dromicia (nana?)*, though differing among themselves considerably in the relative degree of development of their constituent lobes, all agree in having a distinct and free caudate lobe, as well as a Spigelian, and in no system of secondary sulci attaining any degree of development.

In *Phascolomys wombat* the left lateral lobe is the largest; the right central is also large; but the left central is very small, as is the right lateral fissure. The umbilical fissure is distinct, as is the cystic fissure, which allows the gall-bladder, which reaches to the anterior margin of the liver, to appear superficially. There are no distinct caudate or Spigelian lobes, though the former is indicated. There is a tendency, particularly on the left lateral and right central lobes, to develop accessory sulci. As in the Koala, too, the small right lateral lobe is pointed below.

The spleen, as usual in Marsupials, is somewhat triradiate in shape, being broader and forked at one end, tapering and more pointed at the other. Its greatest length is  $2\frac{1}{4}$  inches. There is a lymphatic gland, the size of a pea, outside each marsupial bone,

Fig. 2.



The same, from below.

*R.C.* Right central lobe; *L.C.* left central lobe; *R.L.* right lateral lobe; *L.L.* left lateral lobe; *C.* caudate lobe; *SP.* Spigelian lobe; *G.B.* gall-bladder; *G.D.* bile-duct; *r.l.f.* right lateral fissure; *l.l.f.* left lateral fissure; *u.f.* umbilical fissure; *c.f.* cystic fissure; *V.C.* vena cava inferior; *V.P.* vena portæ; *V.H.* hepatic vein.

and a pair of similar ones, superficial, on the neck. The axillary glands are large.

The heart is of the usual Marsupial type. The right auriculo-ventricular valve is membranous, and nearly complete all round the aperture, being largest on the right side. It is attached to two, or,

in one of my specimens, three *columnæ carneæ*, which also decrease in size from right to left. On the side corresponding with the septum the valve is attached, not to a *columna carnea*, but by *chordæ tendineæ* inserted on the septal wall. There is apparently only a single opening for the coronary veins, just at the entrance of the *inferior cava* into the auricle.

The aorta gives off, in the specimen which died in the Society's Gardens, three vessels from a common trunk, and then the left subclavian, as in *Phalangista* and most other Marsupials<sup>1</sup>. In another specimen, however, the arrangement is as in Man and as in *Phascolomys*, the left carotid arising independently from the aortic arch. Of the two *venæ azygos*, each opening into the superior cava of its side, the *left* is much the larger, the right being formed mainly by vessels derived from only the first few intercostal spaces, whilst below these the veins of the right side pass over, behind the aorta, into the *left azygos*. This is an arrangement I have found in several Marsupials examined, including *Phascolomys*, *Belideus*, *Cuscus*, and *Phalangista*, though not in *Petrogale* or *Hypsiprymnus*. In *Phascolomys* there exists a commissural branch between the first intercostal vein on the right side going to the left, and the last going to the right, *vena azygos*. In the Hedgehog, and some other animals according to Prof. Owen (Anat. Vert. iii. p. 553), the right is also smaller than the left *azygos*, though usually the reverse condition holds; and in the highest forms, where there is only one *vena azygos*, it is the *right* that persists.

The external and internal iliac arteries come off separately from the aorta, there being no common iliac arteries. This disposition is, I believe, nearly universal<sup>2</sup> in the Marsupials, but is by no means confined to them, as I have found it in *Tamandua*, *Tapirus*, and *Hyomoschus*, and Prof. Watson records it in *Hyaena crocuta* (P. Z. S. 1879, p. 89).

The lungs are simple in form. The right side has three, the left two lobes; the lower lobes of each side being about equal in size, and much larger than the others—half as big again as the upper, or two upper, lobes. There is no *azygos* lobe at all.

The female generative organs of *Phascolarctos* have not been, so far as I have been able to ascertain, hitherto described, though Mr. A. H. Young has lately given us an excellent account, with figures, of the corresponding system in the male. In their essential points they differ in no important respect from those of the Wombat<sup>3</sup>.

<sup>1</sup> P.S. Feb. 11, 1881. In a fresh specimen of *Belideus breviceps*, which I have just dissected, I find only *one* trunk arising from the aortic arch; this splits up into 3 branches—a left innominate, dividing into the subclavian and carotid branches for that side, a right carotid, and a right subclavian. Moreover, as in no other Marsupial known to me, there is only one anterior cava, the right and left innominate veins joining to form a larger trunk, some  $\frac{1}{2}$  inch long, which opens into the auricle.

<sup>2</sup> In a *Cuscus maculatus* that I dissected I found the abdominal aorta splitting up into four trunks, the right and left external, and the right internal iliaes, whilst from the remaining or median (caudal) one, the *left* internal iliac was given off some way below the level of the other.

<sup>3</sup> For description of these see Owen, P. Z. S. 1836, p. 52, and Anat. Vert. iii. p. 680 *et seq.*

The ovaries are rounded ovals in shape, considerably depressed, and measuring about .45 inch along their greatest extent. They are cut up by three or four sinuous fissures; each of these lobes is further subdivided into ovisacs, which are of large size for a Mammal, though nothing like so big as the large ones figured by Prof. Owen in *Phascolomys*. The ovaries are enveloped to some extent by the fimbriated ends of the Fallopian tubes, and are enclosed, in common with these, in pouches of delicate peritoneum. The fimbriated ends of the oviducts are attached narrowly to the posterior part of the ovary; they extend hence for about 0.5 inch to the *ostium abdominale*.

The Fallopian tubes are little bent, and are of small calibre, passing gradually into the larger, somewhat fusiform uteri, which, as usual in the Marsupials, are quite separate from each other; muscular, thick-walled, and nearly straight, these open on a prominent, somewhat compressed nipple-like eminence, forming the *os tincae*, by a small pore. The total length of the Fallopian tubes and uteri is about 1.3 inch from the *ostium* at the commencement of the former. The vaginæ are also two in number, each being bent outwards in a simple curve, and not communicating with its fellow at any point. The lower part of each vagina is thick-walled, with but a small central cavity, which opens into the urino-genital sinus by a small pore, 0.2 inch above the opening of the vesical urethra. Above they are thin-walled; and from the internal side is developed a blind *cul-de-sac*, also thin-walled, communicating only with the vagina of its own side and the corresponding uterus, there being a median septum between the two *culs-de-sac*. No opening from the latter into the urino-genital sinus exists in either specimen I have examined. From the *os tincae* there is prolonged downwards on each side a slightly elevated fold of the mucous membrane, which separates off the vagina proper from the more medianly placed *cul-de-sac*.

Both vaginæ and *culs-de-sac* are lined by smooth mucous membrane, with slight longitudinal rugæ. The two uteri, as well as the vaginæ and their *appendices*, are united together by peritoneum. The two ureters penetrate this to open into the neck of the bladder, beyond the termination of the vaginal *culs-de-sac*. The length of the vaginæ is about 0.65 inch, measured in a straight line; that of the *culs-de-sac* about 0.45 inch.

The urino-genital sinus is a tube, with moderately thick walls and longitudinally plicated mucous membrane, of 1.3 inch in length. It communicates below by a considerable aperture with the rectum, and the cloaca so formed is surrounded by a common fold of muscles and integument. A small, flattened, linguiform clitoris, not free at its apex, with two grooves above and about 0.2 inch long, is developed on the anterior wall of the cloaca, beginning at the level where the rectum and urino-genital canal meet.

A second specimen examined—an adult female that has been preserved in spirit, and which, judging from the condition of its mammæ, has been a mother—shows exactly the same relations of these parts as that here described, the only differences being in the sizes of

some of the parts, due, no doubt, to age. The clitoris, however, is free at the apex and slightly bilobed<sup>1</sup>.

The brain of the Koala is represented of the natural size in the accompanying figures (figs. 3-6), of which that representing its superior aspect was taken from the brain before being removed from the cranial cavity, and therefore unaltered by displacement or hardening in spirit. The other three figures are drawn from the brain after hardening in alcohol for some months.

The cerebral hemispheres are remarkable for their simple surface, which is broken up by no convolutions. Broadest behind, they taper forwardly, and so are somewhat pyriform in outline when viewed from above. They leave the *corpora quadrigemina* largely exposed behind; and in consequence the cerebellum is left entirely uncovered: indeed, when the parts are undisturbed (fig. 3) it is not even in contact with the cerebral hemispheres. The greatest length of the cerebral hemispheres is about 1.2 inch; their greatest depth about 0.7 inch. Viewed from the side, their superior contour is seen to be but little arched behind, whilst anteriorly it slopes downwards away rather suddenly towards the olfactory lobes. These last are not large, and but little exposed; in fact, in the undisturbed state, they are covered, when viewed from above, by the hemispheres. The temporal lobe is small. Superiorly the hemispheres, save for a few slight vascular impressions, are altogether smooth; laterally, a well-defined sulcus, running from the temporal lobe forwards, and curved, first upwards and then downwards, is visible. Anteriorly, this separates off the olfactory tract from the side walls of the hemispheres. A slight indentation, about halfway along its course, at the top of its upward convexity, may represent a rudimentary Sylvian fissure. Just behind this is a second similar, though smaller, impression. The olfactory ganglion is large, as is the tract. Internally, the characteristic features of the Marsupial brain<sup>2</sup> are distinct, the corpus callosum being small and indistinct, and the anterior commissure very large. The hippocampal sulcus is distinct and

<sup>1</sup> In *Phascolomys wombat*, in a two-thirds grown female, I can detect no differences of importance whatever from the type here described. The Fallopian tubes are apparently longer, and their fimbriated extremities better developed. The form of the ovaries, and the disposition of the uteri, vaginae, and urinogenital sinus seem to be nearly precisely similar in the two genera.

In *Phalangista vulpina*, on the other hand, considerable differences occur. The Fallopian tubes are shorter in proportion to the uteri, and are more convoluted. The uteri are more distinct from the Fallopian tubes, are more capacious, and strongly curved outwards. Each *os tincae* projects as a prominent and quite free papilla into a common vaginal chamber, formed by the coalescence and fusion of the two *diverticula* present in *Phascolomys* and *Phascolarctos*. This chamber is capacious, and has only a very slight indication of a median septum left.

In *Belideus sciureus* the Fallopian tubes and uteri resemble those of *Phalangista*. The vaginae, however, are much longer and curved on themselves, much as in the Kangaroos. There are apparently two small *culs-de-sac*; but the specimen examined does not allow me to say whether or no they unite. In *Petaurus* (= *Belideus*?), according to Owen (Anat. Vert. iii. p. 682), where the vaginae are also long and curved, the *culs-de-sac* remain separate.

<sup>2</sup> Vide Flower, Phil. Trans. 1865, p. 647.



Fig. 5.

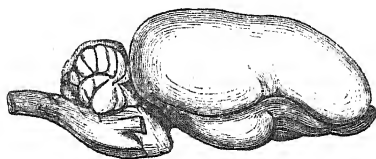


Fig. 4.



Fig. 3.

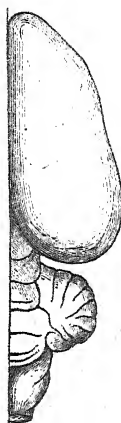


Fig. 6.

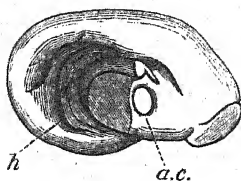


Fig. 3. Right half of Koala's brain, from above, of the natural size; drawn before removal from the skull.

Fig. 4. The same, from below.

Fig. 5. The same, from the side.

Fig. 6. Left cerebral hemisphere, from the inside, the optic thalamus being cut short. *a.c.* anterior commissure; *h.* hippocampal sulcus.

deep, strongly curved, and continued forwards over the corpus callosum onto the internal face of the hemispheres to a point about 0·15 inch in front of the anterior commissure. Behind is another rather deep, *f*-shaped sulcus, which appears at both ends on the prominent rounded margin of the hemispheres. The *corpus fimbriatum* and *fascia dentata* are both distinct. The middle (grey) commissure is very large. Of the *corpora quadrigemina*, the *nates* are longer (from before backwards) than the *testes*. The posterior limb of the crucial impression is not as distinct as the fore one.

In the cerebellum the vermis is well-developed, as are the lateral lobes and the *floculi*, which have the form of projecting, rounded lobes. The *pons Varolii* is narrow, the anterior pyramids well-defined, and the *corpora trapezoides* distinct.

As compared with *Phascolomys*, the principal points of difference in the brain are the more richly convoluted hemispheres—a distinct *calloso-marginal* sulcus being present, as well as others on the external surface—and the non-projecting *floculi*, of the latter. *Phalangista* has nearly as simple a brain as the Koala; but the *floculi* project more.

A consideration of some of the facts on the visceral anatomy of the Koala here stated appears to me to throw considerable light on the classification of the Marsupials. Naturalists generally have placed the Koala in, or close to, the *Phalangistidæ*; whilst the *Wombats* have been retained as a separate family or section, of equal value with the former group, the *Kangaroos* being often, indeed, interposed between the two<sup>1</sup>. Writing as long ago as 1846, Mr. G. R. Waterhouse, in his 'Natural History of the Mammalia' (vol. i.), though in that work keeping the *Phascolomyidæ* separate from the *Phalangistidæ*, evidently did so with some hesitation. He says (*l. c.* p. 16):—"Upon a careful examination of the *Wombat*, I find so many points in common with the *Phalangista* group, that it is so intimately connected with the Koala (which is more clearly an aberrant *Phalanger*), as indicated by the structure of the stomach and the deficiency in the number of the false molars, and the total absence of tail, that I am inclined to regard the genus *Phascolomys* as presenting an aberrant form only of the *Phalangistidæ*. That the thumb should be reduced to a small size in this animal, which differs from others of its (supposed) family in living upon the ground, I am prepared for, since in the *Dasyuridæ* the same thing takes place under similar circumstances. I am also prepared to find in an herbivorous group like the *Phalangistidæ* a difference in the structure of the molar teeth, in having them rooted in one case and rootless in another, for such happens in other herbivorous groups of the *Mammalia*." Again, in a note on p. 257:—"With regard to the position of the *Wombat* and the Koala (*Phascolarctus*) in a natural system, I may observe, in the first place, the *Wombat* (*cæteris paribus*) shows some affinity to the *Phalangistidæ* in the possession of a thumb, which, though short, is very broad and sufficiently distinct. Then, beyond this, we have to add that the

<sup>1</sup> Cf. Owen, "Classification of the Marsupialia," P. Z. S. 1839, p. 19; Selater, Rev. List of Vertebrata, 7th edition, 1879.

limbs are equal, the tibia and fibula are widely separated, excepting, of course, at the extremities; and the stomach is simple<sup>1</sup>, as in the Phalanger group. On the other hand, we perceive in the Koala an animal possessing all the essential characters of *Phalangista*, but in which the stomach is provided with a peculiar glandular apparatus, and the tail is wanting, as in the Wombat. The two animals agree, moreover, very closely in the structure of the humerus; they agree in the non-possession of a patella, in the absence of a *ligamentum teres*<sup>2</sup>, and in the outermost of the articular surfaces of the upper extremity of the tibia being continuous with the articular surface of the fibula. The skull of the Koala, as compared with that of a typical *Phalangista*, differs in having the posterior palatine openings confined to the palatine bone, which is also the case in the Wombat; the lower jaw differs in the greater extent of the symphysis menti; and, lastly, an approximation to that Rodent-like type of dentition which is exhibited by the Wombat is perceptible in the Koala, in the smaller development of the posterior incisors and canines of the upper jaw, and the total absence of any of those premolars which, in the typical Phalangers, intervene between the canine and the five molars of the upper jaw, and the incisor and the corresponding teeth in the lower jaw." Dr. Murie, from his examination of the osteology of the Wombats (P. Z. S. 1867, p. 815), appears also to incline to Mr. Waterhouse's view.

In the course of this paper I have already noted several other points of resemblance between the Koala and Wombat, in the presence in both of more or less distinct cheek-pouches, in the absence of a distinct caudate lobe to the liver and the tendency of its lobes to develop additional superficial sulci, and, finally, in the structure of the female reproductive organs. In the Wombat, too, the first traces of the *syndactyle* condition of the pes appears, both externally and also in the structure of the bones. But, to my mind, the most convincing token of their affinity is their possession of the peculiar gastric gland<sup>3</sup> already referred to and described. In no other Marsupial is there any trace of such a structure visible, whilst in the two forms under consideration its identity is almost precise. That such a unique structure should have been independently developed in two forms unrelated to each other appears to me to be in the highest degree improbable.

The main points of divergence from the Phalangers presented by the Wombat are the peculiarities of its dentition, and its extra-

<sup>1</sup> I suppose by this is meant as opposed to the sacculated stomach of the Kangaroos.

<sup>2</sup> As regards these last two characters, it must be observed that the first is a character practically common to all Marsupials, excepting the Peramelidæ (cf. Flower, 'Osteology of Mammalia,' 2nd ed. p. 306). As regards the alleged absence of a *ligamentum teres*, I find it perfectly well developed in fresh specimens of both Koala and Wombat; on the femur the depression for it, though not distinct, is traceable.

<sup>3</sup> It would be interesting to investigate the histological structure of this gland, with the object of determining whether or not the resemblance is more an external.

ordinary cæcum (see the description and figure by Prof. Flower, Med. Times and Gazette, Dec. 14, 1872, p. 642). In its teeth being all rootless, as well as in the equality in the number of its incisors, *Phascolomys* differs from all other Marsupials. But it is highly probable that this peculiar Rodent-like dentition has been brought about in accordance with its mode of life, and that therefore these features, being adaptive, have in reality less importance in classification than has been assigned to them. Moreover, in a very young Wombat's skull preserved in the Hunterian Museum (1795 D), in which the first three molar teeth only in each jaw have cut the gum and are quite unworn, each lobe of the teeth has two quite distinct, though small cusps; hence the second and third teeth on each side have four distinct cusps, and the anterior two, as in the Phalangers generally. The cæcum is no doubt peculiar, and quite unique amongst Mammalia, any resemblance to the "*appendix vermiciformis*" of the highest Primates being fanciful. If in these points sufficient reason is considered present for elevating the Wombats to the position of a primary group of the Marsupials—whether such group be called a tribe or a family is no matter—it should not be forgotten that in some features *Phascolarctos*, too, is nearly as peculiar as *Phascolomys* itself. These are mainly:—the peculiar alisphe-noidal bulla of the skull; the extraordinary complicated liver, with the elongated gall-bladder; the immensely developed cæcum and cæcum-like ascending colon, with their longitudinal folds of mucous membrane; and the absence of an azygos lobe to the lungs, the Wombats agreeing with the Phalangers in possessing one. Hence it appears to me to be a more natural course to keep these three groups together as subdivisions of a larger one, though whether that one be called a family, or made into a larger section, will depend on the value attached to those ideas by different naturalists. Adopting the former as most convenient, they might be defined briefly as follows:—

#### PHALANGISTIDÆ.

Diprotodont Marsupialia, with clavicles, and not more than six incisors above. The hallux present; the 2nd and 3rd digits of the pes smaller than the others, and more or less united together by integument. Stomach not sacculated. Cæcum present. Glans penis more or less bilobed; vaginæ provided with median *culs-de-sac* which may unite.

##### 1. PHALANGISTINÆ.

Teeth rooted; superior incisors 3.3; at least one small additional premolar on each side above. Tail well developed. No cheek-pouches. Stomach and ascending colon simple. Cæcum long, simple. Liver not complicated by secondary sulci, and with distinct caudate and Spigelian lobes. Lungs with an azygos lobe. Vaginal *culs-de-sac* coalesced (at least in *Phalangista*).

*Phalangista*, *Cuscus*, *Belideus*<sup>1</sup>, *Acrobata*<sup>1</sup>, *Dromicia*<sup>1</sup>.

<sup>1</sup> For an opportunity of dissecting examples of these genera I am indebted to the liberality of our President.

## 2. PHASCOLARCTINÆ.

Teeth rooted; superior incisors 3.3; additional premolars absent. Tail rudimentary. Distinct cheek-pouches. Stomach with a cardiac gland. Cæcum very long; commencing colon cæcum-like, both being dilated and provided with numerous longitudinal folds of mucous membrane. Liver very much complicated by secondary sulci; caudate lobe not free; gall-bladder immensely elongated. Lungs with no azygos lobe. Vaginal *culs-de-sac* free.

*Phascolarctos*.

## 3. PHASCOLOMYINÆ.

All teeth rootless; superior incisors 1.1; no additional premolars. Tail and cheek-pouches rudimentary. Stomach as in *Phascolarctine*. Cæcum short, peculiar. Commencing colon transversely sacculated. Liver somewhat complicated by secondary sulci; no distinct caudate lobe. Lungs with an azygos lobe. Vaginal *culs-de-sac* free.

*Phascolomys*.

4. On a new Genus of *Timeliidæ* from Madagascar, with Remarks on some other Genera. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Department of Zoology, British Museum.

[Received January 6, 1881.]

(Plate XIX.)

The Rev. Deans Cowan last year forwarded to London a collection of birds, which arrived unfortunately in a bad condition, few specimens having escaped the ravages of insects during the voyage. Amongst the latter, I am happy to say, were a few *Timeliine* birds, which have added considerably to our series in the British Museum; and not the least interesting is an example referable to a new genus, which I propose to term

NEOMIXIS, gen. nov.

Not distantly related to *Miwornis*, but easily distinguished by the shape of the bill, which is conical and pointed, with a very sharp culminal ridge, and scarcely any perceptible rictal bristles.

In Madagascar it finds its nearest ally in *Bernieria*, like which genus it has the culmen as long as the tarsus; but the pointed conical bill is very different from the long thin bill of *Bernieria*.

The type is

NEOMIXIS STRIATIGULA, sp. n. (Plate XIX.)

*Adult*. General colour above olive-green, rather more yellowish olive on the head, lower back, and rump, the hind neck somewhat ashy; lesser and median wing-coverts like the back, the greater

coverts and quills light brown, edged with yellowish olive; tail-feathers light brown, margined narrowly with yellowish olive; lores and a very faintly indicated eyebrow light yellow, in front of the eye a dusky spot; cheeks and ear-coverts yellow, mottled with dusky brown tips to the feathers; under surface of body yellow, passing into white on the centre of the abdomen, the lower flanks light ashy brown; the throat and fore neck streaked with dark brown down the centres of the feathers; the breast mottled with larger centres of dusky brown; under tail-coverts dusky brown, with dull white tips; under wing-coverts and axillaries white washed with yellow, the edge of the wing a little brighter yellow; quills brown below, whitish along the edge of the inner web. Total length 4·5 inches, culmen 0·65, wing 2·0, tail 1·7, tarsus 0·65.

*Hab.* Fianarantsoa, Madagascar (*Rev. D. Cowan*).

A better arrangement of the genus *Bernieria* and its allies appears to me to be somewhat as follows:—

- a. Culmine tarsum æquante, vel etiam longiore.
  - a'. Rostro brevi, conico, acuto, culmine haud fornicato, tomis integris. .... *Neomixis*.
  - U'. Rostro longiore, gracili, ad apicem decurrato et evidenter adunco. .... *Bernieria*.
- b. Tarsus quam culmen longiore.
  - c'. Vibrissis vix ullis, minimis; fascia parva supra nares, difficile inveniunda; tarso integro ..... *Mystacornis*.
  - d'. Vibrissis maximis, usque ad apicem rostri productis; tarsis integris. .... *Xanthomixis*.
  - e'. Vibrissis parvis, debilibus, haud ultra nares productis; tarsis integris. .... *Crossleyia*.
  - f'. Vibrissis parvis, debilibus, haud ultra nares productis; tarsis evidenter 4-scutatis ..... *Oxylabes*.

The large series of Mascarene *Timeliidæ* now possessed by the British Museum has enabled me to push my studies of these birds much further; and I find that, as in many other cases of Madagascar birds, the *Timeliidæ* of the island not only form an isolated group, but are divisible into several genera, of which the comparative characters are given above.

The following is a list of the species comprised under the above headings:—

1. *Neomixis striatigula*, Sharpe (*vide supra*).
2. *Bernieria madagascariensis* (Gm.).
3. *Mystacornis crossleyi* (Grandid.).
4. *Xanthomixis zosterops* (Sharpe).
5. *Crossleyia xanthophrys* (Sharpe).

[The Museum now contains four specimens of this curious bird in addition to the original type (described, P. Z. S. 1875, p. 76, as *Oxylabes xanthophrys*). The idea has been suggested to me that it is the young bird of some other species; but I think that this is not likely to prove correct, as one of the specimens before me appears to be a nestling. It is duller-coloured than the adults, more of an olive-brown, the head scarcely darker, and the eyebrow almost im-

perceptible. Again, *O. xanthophrys* cannot be the young of *Oxylabes madagascariensis*, because of the different scutellation of the tarsi, while, moreover, we have the young of the latter bird in the British Museum, and it differs only slightly from the old.]

6. *Oxylabes madagascariensis* (Gm.).

7. *OXYLABES CINEREICEPS*, sp. nov.

Olive-green, with narrow pale shaft-lines; wings and tail olive, the edges to the primaries olive-yellow; head and nape slaty grey, lores dull white; cheeks and sides of face creamy white; ear-coverts slaty grey; throat and fore neck white; rest of under surface of body yellow, olive on the sides; under tail-coverts olive-yellow; thighs olive-brown; under wing-coverts olive-brown washed with fawn-colour; edge of wing yellow; quills light brown below, fulvescent along the edge of the inner web. Total length 5·6 inches, culmen 0·55, wing 2·75, tail 2·3, tarsus 0·85.

*Hab.* Fianarantsoa, Madagascar (*Rev. D. Cowan*).

Notwithstanding the difference in the colouring of the two species, *O. cinereiceps* seems to be strictly congeneric with *O. madagascariensis*.

5. On the Mammals of Gilgit. By JOHN SCULLY.

[Received January 6, 1881.]

The tract of country to be referred to in this paper may be roughly defined as the basin of the Indus river within the limits 35° to 36° 30' N. lat. and 74° to 75° E. long.; it forms the north-western portion of the territories of the Maharaja of Kashmir. My observations refer principally to the Mammalian fauna of Gilgit, a district which lies nearly due north of Srinagar, the capital of Kashmir, at a distance of about 230 miles by road; but I also include the Astor valley, and Nagar, Hunza, and Yassin, three small States which adjoin Gilgit, and are tributary to Kashmir. My limits are—on the south the Dorikun or Burzil Pass at the head of the Astor valley, on the east the great bend of the Indus near Haramosh, on the north the principality of Hunza, and on the west Yasin.

All this country is highly mountainous, and is intersected by numerous narrow valleys, the streams of which are tributary to the Indus. The lowest valleys are about 4500 feet above sea-level, while the mountain ridges are of great height, with peaks from 15,000 to over 26,000 feet high. The lower parts of the valleys are very barren and arid, their sides being formed by steep bare walls of gneiss; the cultivated portions are scattered and of small extent, on terraces of the river-alluvium high above the main streams, or more generally on alluvial fans at the mouths of lateral ravines. Above 8000 feet the scenery changes greatly, and grass-covered downs and luxuriant pine-forests abound; higher up still we find the region of snow-covered peaks and mighty glaciers.

Gilgit itself is a village on the banks of the Gilgit river, about 25 miles above the point where that stream falls into the Indus near Bunji. At the point where Gilgit is situated, the valley is about a couple of miles broad; and cultivation is there carried on on a flat bit of river-alluvium about 40 feet above the stream; the elevation of Gilgit is 4890 feet above the sea. The climate of Gilgit is characterized by an extreme annual range of temperature, and by great dryness. In summer the temperature in the shade is sometimes as high as 109° F., and the heat is rendered very oppressive by the glare and radiation from the bare rocky hill-sides which bound the valley; then in midwinter the cold is severe, the minimum temperature in the shade being often as low as 20° F., while the minimum temperature of radiation occasionally falls to 4° F. From April to September there are occasional light showers; but the total annual rainfall is little over 3 inches. Snow rarely falls in winter about Gilgit itself, and then very quickly melts; but of course the snowfall is very heavy on all the hills about the valley at an elevation of over 7000 feet.

The following notes on the Mammals of Gilgit are based on a collection of about 200 specimens, which I made during a residence of nineteen months in that country. Examples of all the species here enumerated were secured; and of most of them I obtained large series. Of the thirty-three species in my list, thirty-one occur in the immediate neighbourhood of Gilgit; the remaining two species, viz. *Ovis poli* and *Arctomys caudatus*, inhabit respectively the extreme northern and southern limits of the tract included in this paper, *Ovis poli* being found in Hunza and *Arctomys caudatus* at the head of the Astor valley, north of the Dorikun Pass.

All that has hitherto been published on the Mammals of Gilgit is contained in two notes by Mr. W. T. Blanford, in the Journal of the Asiatic Society of Bengal<sup>1</sup>, on some specimens collected by Major Biddulph, and presented by that officer to the Indian Museum in Calcutta. Mr. Blanford in these papers identifies eleven species, which I would reduce to eight or nine.

I am indebted to Major Biddulph, who has long resided in Gilgit, for some interesting specimens of mammals collected by him there, and for some notes about the Ruminants of the region. I have also to express my obligations to Mr. Oldfield Thomas, Dr. G. E. Dobson, and Mr. W. T. Blanford for assistance in the preparation of this paper.

## CHIROPTERA.

### 1. RHINOLOPHUS HIPPOSIDEROS (Bechstein).

*Rhinolophus hipposideros*, Dobson, Cat. Chir. B. M. 1878, p. 117.

This small nose-leaved Bat is fairly common in the warm valleys of the Gilgit district during the summer months. Its vertical range seems to be from about 4000 to 6000 feet above sea-level, and it is

<sup>1</sup> Part II. 1877, pp. 323-327, and 1879, pp. 95-98.



not met with above the latter elevation. It appears about the first week in April, and is not seen after the beginning of October. This Bat has a very powerful and long-sustained flight, and it frequently enters rooms at night. It generally flies higher up in the air than *R. ferrum-equinum*, and is perhaps more frequently found away from dense tree-growth than that species. *R. hipposideros* has not, I believe, been previously recorded from British India.

## 2. RHINOLOPHUS FERRUM-EQUINUM (Schreb.).

*Rhinolophus ferrum-equinum*, Dobson, Cat. Chir. B. M. p. 119.

This species was very common in the low hot valleys of the Gilgit district from about the middle of April to the end of September, appearing a little later in spring and disappearing a little earlier in autumn than *R. hipposideros*. Its flight appeared to be less powerful than that of its smaller relative; and when it entered a room at night it was more easily captured. Its vertical range in the district seems to be from about 4500 to 5500 feet. Its favourite haunts are orchards and clumps of mulberry trees, where insect food is abundant; and in the close hot evenings in summer it could always be found in the lowest parts of the valleys in such situations, flying low down about the trees.

## 3. SYNOTUS DARJILINGENSIS (Hodgson).

*Synotus darjilingensis*, Dobson, Cat. Chir. B. M. p. 177.

This Bat was common in summer in the Gilgit district at an elevation of 5000 feet. It made its appearance as early as the first week in March, and was not seen after the first week in October. It frequently enters rooms in the evening from 8 to 10 o'clock.

All the specimens collected differ from *S. barbastellus* of Europe in not having any projecting lobe on the outer margin of the ear; and in all of them the ear laid forward reaches beyond the end of the muzzle.

## 4. PLECOTUS AURITUS (Linn.).

*Plecotus auritus*, Dobson, Cat. Chir. B. M. p. 178.

This large-eared Bat is not of frequent occurrence in Gilgit. I obtained two specimens in September at an elevation of 5000 feet.

## 5. OTONYCTERIS HEMPRICHI (Peters).

*Otonycteris hemprichi*, Dobson, Cat. Chir. B. M. p. 182.

This fine species does not seem to be very common in the Gilgit valley. A specimen was first obtained there by Major Biddulph in July 1876; and the only specimen I secured was captured in Gilgit in May. It was observed flying over a field about dusk; and its large size at once attracted attention.

## 6. VESPERUGO DISCOLOR (Natt.).

*Vesperugo discolor*, Dobson, Cat. Chir. B. M. p. 204.

This Bat was only observed in summer, in well-wooded country,

at elevations of from 10,000 to 11,000 feet. It only began its flight about dusk, and flew high up and swiftly; so that it was rather difficult to secure specimens. Two specimens were shot in the Nultar valley in August.

7. *VESPERUGO BOREALIS* (Nilsson).

*Vesperugo borealis*, Dobson, Cat. Chir. B. M. p. 203.

Only one specimen of this Bat was obtained in the Gilgit district; I unfortunately omitted to record the date of its capture and the elevation at which it was found.

8. *VESPERUGO PIPISTRELLUS* (Schreb.).

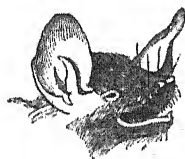
*Vesperugo pipistrellus*, Dobson, Cat. Chir. B. M. p. 223.

This was by far the commonest species of Bat found about Gilgit. Even in the depth of winter a few were occasionally seen.

9. *HARPIOCEPHALUS TUBINARIS*, sp. nov.

Head and muzzle as in *Harpiocephalus suillus*. Ears moderate, rounded off at the tips; the upper third of the outer margin slightly emarginate, the middle third commencing by a moderate convexity, then slightly convex opposite the middle of the tragus, and terminating in a convex lobe in front of the base of the tragus; from near the base of the inner margin of the ear-conch, opposite the posterior angle of the eye, a small but distinct spur-like process projects abruptly forwards. Tragus moderately long, tapering above,

Fig. 1.



Head of *Harpiocephalus tubinaris*, nat. size.

where it curves outwards; a small pointed lobule above the base of the outer margin, succeeded by a well-marked emargination, immediately above which the tragus attains its greatest width; inner margin convex in its upper two thirds, nearly straight at the base; outer margin nearly straight below, the upper half concave.

Thumb long, with a strong claw. Wings from the side of the proximal phalanx of the outer toe; extreme tip of tail projecting.

Distribution of the fur as in *H. suillus*: above blackish brown at the base, the distal halves of the hairs pale greyish brown; below dusky on basal halves, the tips being white; the superficial colour of the fur is therefore greyish brown on the upper parts of the animal, and white below,

The outer incisor is distinctly shorter than the inner, and does not touch the canine. The first upper premolar is smaller than the second; but there is not quite such a disproportion in size between these teeth as obtains in *H. suillus*. In other respects the dentition is the same as in the last-mentioned species.

Length,\* head and body 1''·8, tail 1''·4, head 0''·73, ear 0''·55, tragus 0''·32, forearm 1''·4, third finger 2''·55, fifth finger 2''·07, thumb 0''·45, tibia 0''·67, calcaneum 0''·57, foot and claws 0''·37.

The animal described above is, I think, distinct from all the species of *Harpiocephalus* described in Dr. Dobson's Catalogue of Chiroptera; and I propose for it the name of *H. tubinaris*. It is perhaps more nearly allied to *H. suillus* than to any other known species, but differs in having the upper third of the ear-conch less emarginate, in possessing a spur on the inner margin of the ear, and in the fur being very differently coloured. In the last two characters it resembles *H. leucogaster*.

This Bat does not seem to be common in the district. I only secured one specimen, which had entered my room in Gilgit at night on the 20th August.

## CARNIVORA.

### 10. FELIS UNCIA, Schreb.

*Felis uncia*, Schreber, Säugeth. i. p. 386 (1778, ex Buff.).

The Ounce is fairly common in the Gilgit district, in Hunza and Nagar, and in Yassin. It is usually found high up in the hills, about the grounds frequented by the Himalayan Ibex and Markhor; and it preys on these animals. It does not seem to be very shy; and I have known it to attack and kill ponies at pasture not very far from human habitations. In winter it occasionally descends as low as an elevation of 6000 feet for a raid on sheep and goats, which it slaughters wantonly. I procured several fine specimens of the Ounce about Gilgit.

### 11. FELIS LYNX, Linn.

*Felis lynx*, Linnæus, Syst. Nat. i. p. 62.

The Lynx is found in the same localities as the Ounce, but always at a lower elevation and in rather greater numbers. It does not frequent such open ground as the Ounce, and of course only preys on the smaller wild mammals. It frequently haunts the outskirts of villages at an elevation of about 5000 feet, and is a dreadful foe to goats and sheep. A pair of these animals killed six sheep in one night near Gilgit. My specimens agree with the European form of Lynx, and not with the paler *F. isabellina* of Blyth.

### 12. CANIS LUPUS, Linn.

*Canis lupus*, Linnæus, Syst. Nat. i. p. 58.

Wolves are found in the valley of the Gilgit river from Gakuch to the Indus, and in all the smaller lateral valleys between those two points. They usually go about in pairs or in small packs,

hiding during the day in rocky ground or in the dry beds of small mountain-streams. In winter the Wolves frequently prowl about houses during the night, to the great annoyance of the dogs; and they often kill goats and sheep. The young are born early in May.

My specimens of this animal from Gilgit have the upper carnassial tooth slightly longer than the two upper molars, and are therefore probably distinct from *C. pallipes* and *C. laniger*, in which the fourth upper premolar is shorter than the two upper molars together (Blanford, P. A. S. B. 1877, p. 116). In size and coloration, moreover, the Gilgit Wolf agrees with the European species.

### 13. *CUON PRIMÆVUS*, Hodgk.

*Cuon primævus*, Hodgson, Proc. Zool. Soc. 1833, p. 111; Asiatic Researches, xviii. p. 221.

This species appears to be widely distributed in the Astor and Gilgit districts, and is said to be found in Yassin and Chitral; its habits are very well known. A specimen from Gilgit agrees in all particulars with examples from Nepal and other parts of the Himalayas. In all the skulls of this species which I have examined the upper sectorial tooth is longer than the two upper molars taken together; the reverse is the case in *C. alpinus* of Pallas, from the Altai.

### 14. *VULPES MONTANA*, Pearson.

*Vulpes montana*, Pearson, J. A. S. B. 1836, p. 313; Blanford, J. A. S. B. 1877, ii. p. 324, and 1879, p. 95.

Foxes are very common in the Astor and Gilgit districts, in Hunza, Nagar, Yassin, and Chitral. About Gilgit the Hill-Fox is found on stony ground, in the vicinity of cultivation, at elevations of from 5000 feet to 10,000 feet. The young are born in May.

In a large series of these Foxes which I have, there is great variation in colour, some being pale yellowish fulvous above and white below (*V. flavescens*, Gray), while others are very dark and rufous above, with the underparts black; but all intermediate forms occur. There are also some minor differences in the skulls and in the size of the teeth; but I cannot find that these are correlated with the differences in colour of the pelage. According to Mr. Blanford's views there are in the Gilgit district, besides *V. montana*, three other species or races, viz. *V. melanotus* (?), *V. griffithi*, and *V. flavescens*; but I doubt if these forms are more than varieties. A fox shot by Major Biddulph in Chitral is not distinguishable from some examples of *V. montana* from Simla.

### 15. *MARTES FOINA* (Erxl.).

*Mustela foina*, Erxleben, Syst. Reg. An. p. 458 (1777).

The Beech-Marten is common in the Gilgit district, and in Hunza, Nagar, and Yassin, where great numbers are killed by the natives for the sake of the fur. This Marten usually keeps high up

in the hills, and is only rarely found in the vicinity of villages as low as 5000 feet. In coloration and in dental and cranial characters my specimens from the Gilgit valley accord completely with *M. foina* as defined by Mr. Alston (P. Z. S. 1879, p. 469).

#### 16. *MUSTELA TEMON*, Hodgs.

*Mustela temon*, Hodgson, J. A. S. B. 1857, p. 207.

This yellow-bellied Weasel is fairly common in the Gilgit district at elevations of from 6000 to 12,000 feet. Two specimens in my collection from Gilgit agree well with Hodgson's original description. The figure of *M. temon* in Mr. Hodgson's drawings, now in the British Museum, shows that the type was rather darker on the upper surface than my examples; and this is also the case in a skin from Sikkim or Tibet in Mr. Blanford's collection; but the Gilgit and Sikkim animals are certainly specifically identical.

I was disposed to identify this Weasel with *M. alpina*, Gebler, from the Altai (Moscou Mémoires, vi. 1823, p. 213); but Radde's figure and measurements of the skull of *M. alpina*<sup>1</sup> from the typical locality seem to indicate a different species. A still older name, which may have to be used for this species, is *Mustela altaica*, Pallas (Zoogr. Rosso-Asiat. i. p. 98, 1811).

#### 17. *LUTRA VULGARIS*, Erxl.

*Lutra vulgaris*, Erxleben, Syst. Reg. Anim. p. 448 (1777); Blanford, J. A. S. B. 1877, ii. p. 324.

Otters are tolerably common in the Gilgit river and its tributaries. Of the specimens of Otter which I obtained in the Gilgit district two agree in all respects with the Common Otter of Europe. The skull of one of these animals, a male, differs from the figure of the type of *L. nair*, Cuv. (Anderson, Anatomical and Zoological Researches in Western Yunnan, &c. pl. xi.), precisely in the points mentioned by Dr. Anderson for the differentiation of *L. nair* and *L. vulgaris*.

#### 18. *URSUS ISABELLINUS*, Horsfield.

*Ursus isabellinus*, Horsfield, Linn. Trans. xv. 1827, p. 332.

*Ursus leuconyx*, Severtzoff, Turk. Jev. p. 80 (1873); Ann. & Mag. Nat. Hist. 1876, xviii. p. 43.

Bears are common in the Astor valley and the Gilgit district, where they are usually found above the forest-region. In October numbers of these animals descend into the valleys as low as 6000 or 5000 feet to feed in the fields, and are then often killed by the peasants. This Bear retires in winter to the shelter of rocks and caves, and remains in a semitorpid state during the season of severe cold. It becomes active again about March. Its usual food consists of fruits and roots; and it appears also to be fond of insects; on the grassy glades between the forests above Gilgit, at elevations of 9000 to 10,000 feet, the loose stones which lie about are constantly found

<sup>1</sup> Reisen Süd. Ost-Sib. i. p. 50.

to have been turned aside by Bears in their search for insects. The natives add that this Bear will devour any carcass it may chance to find in its wanderings.

In the Gilgit district the young are usually born about the middle of May.

The Gilgit Bear agrees well in external characters with Severtzoff's description of his *Ursus leuconyx*. The claws are pale horny or quite white; and the length of half a dozen specimens, measured in the flesh, varied from 4 feet 8 inches to 5 feet 8 inches. There is, as usual, considerable variation in the skulls. I was disposed at first to consider *U. leuconyx* separable from *U. isabellinus* on account of its smaller size, white claws, and more rufous-brown coloration; but I doubt if there be any constant distinction. *U. isabellinus* is usually spoken of as a large Bear, equal in size to *U. arctos*. Jerdon says ('Mammals of India') that a moderate-sized one measured 7 feet 6 inches; and Kinloch ('Large Game of Thibet') says that it attains a length of 7 feet. In the original description of the species, however, *U. isabellinus* is expressly said to be smaller than *U. arctos*, the length of the skin which formed the type being 3 feet 10 inches only. Again, *U. isabellinus* has pale horn-coloured claws very little darker than in *U. leuconyx*. As to the colour of the fur, this varies so much in both forms that no specific difference can be founded upon it.

## RODENTIA.

### 19. SCIUROPTERUS FIMBRIATUS (Gray).

*Sciuropterus fimbriatus*, Gray, Mag. Nat. Hist. n. s. i. p. 584 (1837).

This Flying Squirrel is not very common in the Gilgit district, where it is confined to forest-country at elevations of from 8000 to 12,000 feet. All my specimens were procured in pine-forests.

### 20. ARCTOMYS CAUDATUS, Jacq.

*Arctomys caudatus*, Jacquemont, Voyage dans l'Hinde, iv. p. 66 (1844).

This fine Marmot was only found on the southern limit of the region included in this paper. On the Astor side of the Burzil Pass the Long-tailed Marmot is found in considerable numbers; but I have no evidence of its occurrence west of the Indus anywhere in the vicinity of Gilgit.

### 21. MUS ALEXANDRINUS, Geoff.

*Mus alexandrinus*, Geoffroy, Descr. de l'Egypte, Hist. Nat. ii. p. 733 (1812).

*Mus rufescens*, apud Jerdon, Mamm. of India, p. 199; Blanford, J. A. S. B. 1879, ii. p. 97.

Common throughout the inhabited parts of the Gilgit district, from 4000 to 7000 feet above sea-level. It is chiefly a Field-Rat, but often enters houses; and its young are frequently found in sheds

and outhouses. The Gilgit Rat is not separable from the so-called *M. rufescens* of Calcutta or *M. robustus* (Blyth) of Burma; and it also agrees in all essential characters with *M. alexandrinus* (Geoff.). A specimen of *M. alexandrinus* from Algeria, in the British Museum, only differs from one of my Gilgit specimens in having rather harsher fur.

## 22. *MUS ARIANUS*, Blanford.

*Mus arianus*, W. T. Blanford, Ann. & Mag. Nat. Hist. 1881, vii. p. 162.

*Mus erythronotus*, W. T. Blanford, Zoology of Persia, 1876, p. 54, pl. v. f. 3; J. A. S. B. ii. 1879, p. 97, nec Temminck.

This long-tailed Field-Mouse, which is closely allied to *M. sylvaticus* (Linn.), is fairly common in the Gilgit district at elevations of from 5000 to 10,000 feet. It is found on grassy downs in the vicinity of forests, and about hedges in cultivated ground. In the beginning of winter, after a few heavy falls of snow on the hills, this Mouse often enters houses at night, and is then very bold and troublesome.

## 23. *CRICETUS PHÆUS*, Pallas.

*Cricetus phæus*, Pallas, Zoogr. Rosso-Asiat. i. p. 163 (1811); Blanford, J. A. S. B. 1879, ii. p. 96.

This Hamster is found in the Gilgit district at elevations of 5000 to about 9000 feet. It is common in summer about pasture-grounds and on the outskirts of pine-forests; and it very commonly enters shepherd's huts, where, indeed, most of my specimens were captured.

## 24. *CRICETUS FULVUS*, Blanford.

*Cricetus fulvus*, Blanford, J. A. S. B. 1875, ii. p. 108; *ibid.* 1879, p. 97.

This form occurs in the same localities as the preceding species, and has the same habits; its young are born during the first week in March. Gilgit specimens of this Hamster agree in dimensions with typical examples from Eastern Turkestan; but the colour of the upper parts is greyer and less tinged with yellow.

## 25. *CRICETUS ISABELLINUS*, De Fil.

*Cricetus isabellinus*, De Filippi, Viaggio in Persia, 1865, p. 344.

Two specimens of a Hamster captured in the Nultar valley in July, at an elevation of about 9000 feet, agree well with De Filippi's description of *C. isabellinus*. The length of the head and body in my specimens, measured in the flesh, was 5.35 and 5.25, while the type measured 5.9; but De Filippi no doubt took his measurement from a skin, and the skin of the smaller of my two specimens now measures 6 inches. This form seems to me only to differ from *C. fulvus* in size; and I believe that both *C. fulvus* and *C. isabellinus* must be regarded as merely subspecies of *C. phæus*.

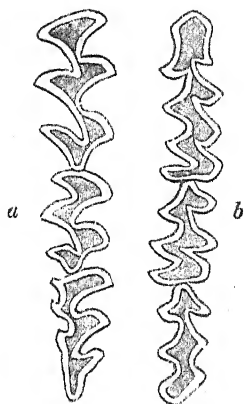
26. *ARVICOLA BLANFORDI*, Scully.

*Arvicola blanfordi*, Scully, Ann. & Mag. Nat. Hist. 1880, vi. p. 399.

Ears rather large, well haired, showing distinctly above the fur of the head. Tail long, always over one third, and usually about one half the length of the head and body. Heel sparsely haired as far as the posterior tubercle; the rest of the sole quite naked. Fore foot with five tubercles, arranged three and two; hind foot with six tubercles, arranged two, two, one and one.

General colour of the fur above greyish brown with a slight rufous tinge, the hairs deep slate-colour for the greater portion of their length, the ends being pale brown with blackish tips. Under surface greyish white, the hairs deep slaty at their base, with white

Fig. 2.



Teeth of *Arvicola blanfordi*,  
magnified.

a. Upper molar; b. lower molar.

Fig. 3.



Hind foot of  
*Arvicola blanfordi*, nat. size.

tips; along a line which separates the colour of the upper and lower surfaces the tips of the hairs are isabelline. The feet are covered with white hairs. Tail sullied white, with a dusky stripe along its upper surface, which is most conspicuous near the tip.

The molar pattern is as follows:—

Upper	I....	5	spaces,	3	external	and	3	internal	angles.
"	II. ..	4	"	3	"	"	2	"	"
"	III... 3	"	"	3	"	"	3	"	"
Lower	I....	7	"	4	"	"	4	"	"
"	II. ..	5	"	3	"	"	3	"	"
"	III. ..	3	"	3	"	"	3	"	"



The teeth are very like those of *A. roylei*; but there are some differences, of which the most obvious is that in *A. blanfordi* the anterior internal angle of the first upper molar is in advance of the anterior external angle; whereas the reverse is the case in *A. roylei*. The cemental prisms of the hinder upper molar are also differently separated in the two species.

*Arvicola blanfordi* differs widely from *A. roylei* in colours and proportions; in general coloration it approaches *A. stracheyi* (Thomas), but is well distinguished from that species by the pattern of its teeth and by its proportions. *A. blanfordi* may be readily known from all species of *Arvicola* hitherto found in British India by its long tail.

The following particulars were noted of a freshly killed male:—Head and body 4.55 inches, tail 2.05, hairs at end of tail 0.2, fore foot 0.4, hind foot 0.75, length of ear 0.7, breadth of ear 0.68. Lips, hands, and feet flesh-colour, the nose a little darker; irides blackish brown.

This Vole is very common in summer in the Nultar valley, near Gilgit, at elevations of from 9000 to 10,000 feet; it is also found, I believe, at similar elevations in the lower part of the Astor valley. I obtained all my specimens of *A. blanfordi* from the outskirts of forests where cattle were grazing, and about shepherds' huts.

## 27. LAGOMYS MACROTIS, Günther.

*Lagomys macrotis*, Günther, Ann. & Mag. Nat. Hist. 1875, p. 231.

This species is fairly common in the Gilgit district at elevations of from 10,000 to 13,000 feet, frequenting open stony ground near the snow-line. Wherever found it occurs in numbers; but it appears to be very local in its distribution. A specimen obtained on the hills above Gilgit only differs from the type of *L. macrotis* in being greyer above, and having a well-marked rufous band across the throat.

In the 'Journal of the Asiatic Society of Bengal,' ii. 1877, p. 326, Mr. Blandford describes a specimen of *Lagomys* obtained by Major Biddulph in the Gilgit district, and refers it doubtfully to *L. auritus*.

## 28. LEPUS TIBETANUS, Waterhouse.

*Lepus tibetanus*, Waterhouse, P. Z. S. 1841, p. 7.

This Hare is common in suitable localities in the Astor valley, the whole of the Gilgit district, and in parts of Hunza, Nagar, and Yassin. It occurs on open stony ground in the valleys and on the hill-sides, and commonly about tamarisk-growths along the banks of streams; its vertical range in the Gilgit district seems to be from 5000 to about 11,000 feet. The young are born about the end of March, and are often met with near the snow-line at that season. The Gilgit Hare, of which I have collected a large series, agrees well with Mr. Waterhouse's original description of *L. tibetanus*, and,

in all external characters, with the type of that species preserved in the British Museum.

In the 'Journal of the Asiatic Society of Bengal,' 1877, ii. pp. 324-326, Mr. Blanford described, as a new species, a Hare obtained by Major Biddulph in Yassin, under the name of *L. biddulphi*. So far as it is possible to arrive at a conclusion on such a point without actual examination of the type, I believe that *L. biddulphi* is the same as *L. tibetanus*; and I will briefly give my reasons for this opinion.

Mr. Blanford considers that *Lepus biddulphi* closely approaches *L. tibetanus*, but differs in some cranial characters, which he details at length, the skulls of *L. tibetanus* which he uses for his comparison being those of the Hare inhabiting the Nubra valley in Ladak. But the type of *L. tibetanus* was obtained in the neighbourhood of Iskardo, a point midway between Yassin and the Nubra valley; so that if there be a specific difference between the Yassin and Nubra Hares, it is quite as likely that the latter would require a new name as the former: the skull of the type of *L. tibetanus* is not available for examination. Further, there is now in the British Museum a specimen of a Hare collected by Major Biddulph in Yassin, in September 1876, at an elevation of 7000 feet. This must have been obtained in the very same valley as the type of *L. biddulphi*, and in the same month. This example agrees perfectly in external characters with my Gilgit specimens, with the type of *L. tibetanus*, and with the Nubra-valley Hare.

Dr. Günther kindly allowed the skull of the Yassin Hare mentioned above and one of the Nubra specimens to be extracted for examination; and I found that the first agreed well with my Gilgit specimens, and only differed slightly from the Nubra-valley skull in having the posterior ends of the nasals less rounded and the parietals a little flatter. In all these specimens the nasals extend backwards some distance beyond the posterior terminations of the premaxillæ. I believe that the Hares from the Nubra valley, Iskardo, Gilgit, and Yassin are not specifically separable.

## UNGULATA.

### 29. CAPRA SIBIRICA, Meyer.

*Capra sibirica*, Meyer, Zool. Annal. i. 397 (1794).

The Himalayan Ibex is common in the Astor valley, the Gilgit district, Nagar, Hunga, and Yassin. It inhabits a higher zone than the Markhor (*Capra falconeri*), well above the forest-region, where occasional grassy slopes are to be found near the crests of the mountains. In a large series of horns of this animal, from the countries mentioned above, a considerable variation in curvature is found; and in some specimens the points of the horns converge, while in others they diverge; but these variations obviously do not indicate any specific difference. The very dark Himalayan Ibex occasionally mentioned by authors are merely old males in winter vesture, and are not confined to any particular locality.

30. *CAPRA FALCONERI*, Hügel.

*Capra falconeri*, Wagner, Münch. gelehrte Anzeigen, ix. 1839, p. 430.

This species is very common in the Astor valley and the Gilgit district, usually keeping close to the forest-region, but descending in the depth of winter as low as 5000 feet. It changes its quarters a good deal according to season, and as a rule is not to be found in those portions of the hills where the lowest valleys are higher than 8000 feet. It frequents most difficult ground, moves easily over very steep rocky hill-sides, and far excels the Himalayan Ibex in agility. The Gilgit Markhor is typical *C. falconeri*, the horns having a very open spiral curve, but, of course, varying a little. A specimen from Gilgit in Major Biddulph's collection has the horns with quite as open a spiral as is shown in the figure of Hügel's type of *C. falconeri*. The Suliman Markhor (*Capra megaceros* of Hutton) is apparently a separate form.

31. *OVIS POLI*, Blyth.

*Ovis poli*, Blyth, P. Z. S. 1840, p. 62; Biddulph, Proc. Asiat. Soc. Bengal, 1879, p. 280.

This fine Sheep is found in the northern part of Hunza, on the Shimshal Pamir. Judging from the number of heads sent in to Gilgit, this animal must inhabit Hunza in great numbers. The occurrence of this species south of the Mustagh range and the watershed of the Indus is a matter of great interest; it must now be included in the list of Mammals of British India as commonly understood.

32. *OVIS VIGNEI*, Blyth.

*Ovis vignei*, Blyth, P. Z. S. 1840, p. 70.

This Sheep is found in great numbers in the Gilgit district and the Astor valley. It frequents the bare hill-sides below the forests, and barren stony ground at the foot of the hills as low as 4500 feet. Large herds are frequently seen; but, owing to the open ground they frequent, it is very difficult to stalk them successfully. They wander about much and swim well.

33. *MOSCHUS MOSCHIFERUS*, Linn.

*Moschus moschiferus*, Linnæus, Syst. Nat. i. p. 91.

The Musk-Deer occurs in fair numbers in the Gilgit district, and is more common in the Astor valley. Specimens from the vicinity of Gilgit exhibit some variations in colour, such as have often been noted with respect to this species in other parts of the Himalayas. The Musk-Deer is, I believe, not found in Nagar, Hunza, or Yassin, but is common in parts of Chitral.

February 1, 1881.

Professor Flower, LL.D., F.R.S., President, in the Chair.

The following papers were read :—

1. On the Evolution of the Placenta, and on the possibility of employing the characters of the Placenta in the Classification of the Mammalia. By F. M. BALFOUR, M.A., F.R.S., Fellow of Trinity College, Cambridge.

[Received January 22, 1881.]

From Owen's observations on the Marsupials it is clear that the yolk-sac in this group plays an important (if not the most important) part, in absorbing the maternal nutriment destined for the fœtus. The fact that in Marsupials both the yolk-sac and the allantois are concerned in rendering the chorion vascular, makes it *à priori* probable that this was also the case in the primitive types of the Placentalia; and this deduction is supported by the fact that in the Rodentia, Insectivora, and Cheiroptera this peculiarity of the fœtal membranes is actually found. In the primitive Placentalia it is also probable that from the discoidal allantoic region of the chorion simple fœtal villi, like those of the Pig, projected into uterine crypts; but it is not certain how far the umbilical region of the chorion, which was no doubt vascular, may also have been villous. From such a primitive type of fœtal membranes divergences in various directions have given rise to the types of fœtal membranes found at the present day.

In a general way it may be laid down that variations in any direction which tended to increase the absorbing capacities of the chorion would be advantageous. There are two obvious ways in which this might be done, viz. (1) by increasing the complexity of the fœtal villi and maternal crypts over a limited area, (2) by increasing the area of the part of the chorion covered by the placental villi. Various combinations of the two processes would also, of course, be advantageous.

The most fundamental change which has taken place in all the existing Placentalia is the exclusion of the umbilical vesicle from any important function in the nutrition of the fœtus.

The arrangement of the fœtal parts in the Rodentia, Insectivora, and Cheiroptera may be directly derived from the primitive form by supposing the villi of the discoidal placental area to have become more complex, so as to form a deciduate discoidal placenta, while the yolk-sac still plays a part, though physiologically an unimportant part, in rendering the chorion vascular.

In the Carnivora, again, we have to start from the discoidal placenta, as evinced by the fact that in the growth of the placenta the

allantoic region of the placenta is at first *discoidal*, and only becomes zonary at a later stage. A zonary deciduate placenta indicates an increase both in area and in complexity. The relative diminution of the breadth of the placental zone in late foetal life in the zonary placenta of the Carnivora is probably due to its being on the whole advantageous to secure the nutrition of the foetus by ensuring a more intimate relation between the foetal and maternal parts, than by increasing their area of contact. The reason of this is not obvious, but, as shown below, there are other cases where it is clear that a diminution in the area of the placenta has taken place, accompanied by an increase in the complexity of its villi.

The second type of differentiation from the primitive form of placenta is illustrated by the Lemuridae, the Suidae, and *Manis*. In all these cases the area of the placental villi appears to have increased so as to cover nearly the whole subzonal membrane, without the villi increasing to any great extent in complexity. From the diffused placenta covering the whole surface of the chorion, differentiations appear to have taken place in various directions. The placenta of Man and Apes, from its mode of ontogeny, is clearly derived from a diffused placenta (very probably similar to that of Lemurs) by a concentration of the foetal villi, which are originally spread over the whole chorion, to a disk-shaped area, and by an increase in their arborescence. Thus the discoidal placenta of Man has no connexion with, and ought not to be placed in, the same class as those of the Rodentia, Cheiroptera, and Insectivora.

The polycotyledonary forms of placenta are due to similar concentrations of the foetal villi of an originally diffused placenta.

In the Edentata we have a group with very varying types of placenta. Very probably these may all be differentiations within the group itself from a diffused placenta such as that found in *Manis*. The zonary placenta of *Orycteropus* is capable of being easily derived from that of *Manis* by the disappearance of the foetal villi at the two poles of the ovum. The small size of the umbilical vesicle in *Orycteropus* indicates that its discoidal placenta is not, like that of the Carnivora, directly derived from a type with both allantoic and umbilical vascularization of the chorion. The discoidal and dome-shaped placenta of the Armadillos, *Myrmecophaga*, and the Sloths may easily have been formed from a diffused placenta, just as the discoidal placenta of the Simiidae and Hominidae appears to have been formed from a diffused placenta like that of the Lemuridae.

The presence of zonary placenta in *Hyrax* and *Elephas* does not necessarily afford any proof of affinity of these types with the Carnivora. A zonary placenta may be quite as easily derived from a diffused placenta as from a discoidal placenta; and the presence of two villous patches at the poles of the chorion in *Elephas* very probably indicates that its placenta has been evolved from a diffused placenta.

Although it would not be wise to attempt to found a classification upon the placental characters alone, it may be worth while to make

a few suggestions as to the affinities of the orders of Mammalia indicated by the structure of the placenta. We clearly, of course, have to start with forms which could not be grouped with any of the existing orders, but which might be called the Protoplacentalia. They probably had the primitive type of placenta described above: the nearest living representatives of the group are the Rodentia, Insectivora, and Cheiroptera. Before, however, these three groups had become distinctly differentiated, there must have branched off from the primitive stock the ancestors of the Lemuridæ, the Ungulata, and the Edentata.

It is obvious on general anatomical grounds that the Monkeys and Man are to be derived from a primitive Lemurian type; and with this conclusion the form of the placenta completely tallies. The primitive Edentata and Ungulata had no doubt a diffused placenta which was probably not very different from that of the primitive Lemurs; but how far these groups arose quite independently from the primitive stock, or whether they may have had a nearer common ancestor, cannot be decided from the structure of the placenta. The Carnivora were certainly an offshoot from the primitive placental type which was quite independent of the three groups just mentioned; but the character of the placenta of the Carnivora does not indicate at what stage in the evolution of the placental Mammalia a primitive type of Carnivora was first differentiated.

No important light is thrown by the placenta on the affinities of the Proboscidea, the Cetacea, or the Sirenia; but the character of the placenta in the latter group favours the view of their being related to the Ungulata.

## 2. On some Birds collected by Mr. E. F. im Thurn in British Guiana. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received January 17, 1881.]

Mr. Everard F. im Thurn having placed in my hands for determination a series of bird-skins collected by himself or under his supervision in British Guiana in 1878 and 1879, I have had great pleasure in putting names to these specimens. Amongst the 160 species, examples of which are in the collection, are some which require a few remarks for their better identification. These are:—

### 1. VIREOLANIUS LEUCOTIS (Sw.).

*Vireolanius leucotis*, Salvin, Ibis, 1878, p. 443, pl. xi.

One example, obtained in June 1879 on the Mazaruni river by H. Pauli, a collector employed by Mr. im Thurn.

The acquisition of this specimen is very satisfactory, as it enables

me to say that the supposed Guianan *V. chlorogaster* (cf. Salvin, *l. s. c.*) is inseparable from *V. leucotis*, and that this species therefore ranges from Cayenne and the Rio Negro to the Huallaga. Mr. im Thurn's specimen is inseparable from skins obtained by Mr. Buckley at Sarayacu, Ecuador.

## 2. CYANICTERUS VENUSTUS, Bp.

*Orthogonys cyanicterus*, Scl. P. Z. S. 1856, p. 122.

*Cyanicterus venustus*, Bp. Consp. i. p. 240 (1850).

*Callithraupis cyanicterus*, Berl. orn. Centralbl. 1879, p. 63.

A single female example of this Tanager, obtained on the Mazaruni river by the same collector.

Mr. im Thurn gives me the following note on this species:—"Two examples of this bird were brought to me at the same time by Pauli; but one of them, which was evidently a male, was afterwards completely destroyed by ants. When giving them to me, Pauli, who has collected diligently in Guiana for upwards of forty years, told me that he had only once before met with one of these birds, and that was on the same river."

## 3. ORCHESTICUS ATER.

*Orchesticus ater*, Scl. P. Z. S. 1856, p. 67.

*Tanagra olivina*, Scl. P. Z. S. 1864, p. 607, et 1873, p. 186, pl. xxi. (jun.).

Graf von Berlepsch has convinced me of the fact, which I could at first hardly believe, that my *Tanagra olivina* (ex Natt. MS.) is merely the young bird of *Orchesticus ater*. A skin obtained by Mr. im Thurn on the Corentyn river in November 1879 well serves to confirm this excellent identification. The general plumage is green, as in *Tanagra olivina*, so-called; but the black colour is beginning to show on the lores, throat, and upper wing-coverts.

## 4. AGELEUS IMTHURNI, sp. nov.

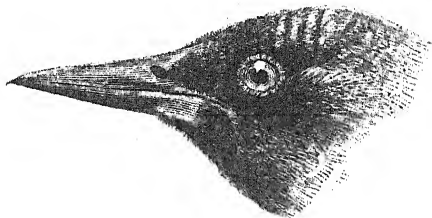
*Thilius major*, Bp. Compt. Rend. xxxvii. p. 833 (1853)?

*Nigerrimus unicolor*, fasciculo plumarum axillari flavo; rostro et pedibus nigris: long. tota 10.4, alæ 5.0, caudæ rotundatæ rectr. med. 4.8, ext. 3.8, rostri 1.2, tarsi 1.2.

Hab. Guiana Brit. int. (im Thurn).

Mr. im Thurn's series contains a single example of this fine and well-marked Icterine bird, which is quite new to me. It was obtained by Mr. im Thurn himself at the Kaieteur Waterfall on the Potaro river in November 1878. Though the generic divisions of the Icteridæ are a little puzzling, I am disposed to place this along with the true *Agelai*, as arranged in the 'Nomenclator,' next to *A. thilius*, of Chili, from which it may be at once distinguished by its much larger size, by the yellow colour being confined to the tuft of axillary plumes, and by both upper and under wing-coverts being black.

Bonaparte's *Thilius major* may have been possibly founded upon an example of this species; but the description is too short to be certain; and, as I have been kindly informed by M. Alph. Dubois, the type specimen (stated to be in the Brussels Museum) cannot be found. I have therefore named this interesting addition to the Guianan avifauna after its discoverer, who has supplied me with the subjoined note on it.



Bill of *Agelaius inthurni*.

"A considerable flock of these birds, numbering about 40, was always to be found during the three days I remained in the neighbourhood, in the trees on the edge of the forest round the open plateau from which the Kaieteur falls. They attracted considerable attention by their incessant chattering, their note being like, but far less shrill than, that of *Cassicus persicus*. These cries were kept up throughout the day, and were almost the only bird-notes to be heard about noon. The Indians of my own party, who were not from that district, had never seen the birds before; but some Ackawor Indians who lived in that neighbourhood declared that they knew them well: this, as Indians are very careful observers of birds, shows almost conclusively that the species is local in Guiana. Between us we secured three specimens."

5. *OGTHÆCA MURINA*, Scl.

*Ochthæca murina*, Scl. P. Z. S. 1871, p. 749.

An example from the Corentyn river, obtained in July 1879.

I am glad to have the habitat of this species confirmed, as it is by Mr. im Thurn's specimen, and by others collected in the same district, I believe, by Mr. C. Barrington Brown, one of which is in my collection.

6. *HETEROPELMA IGNICEPS*, Scl.

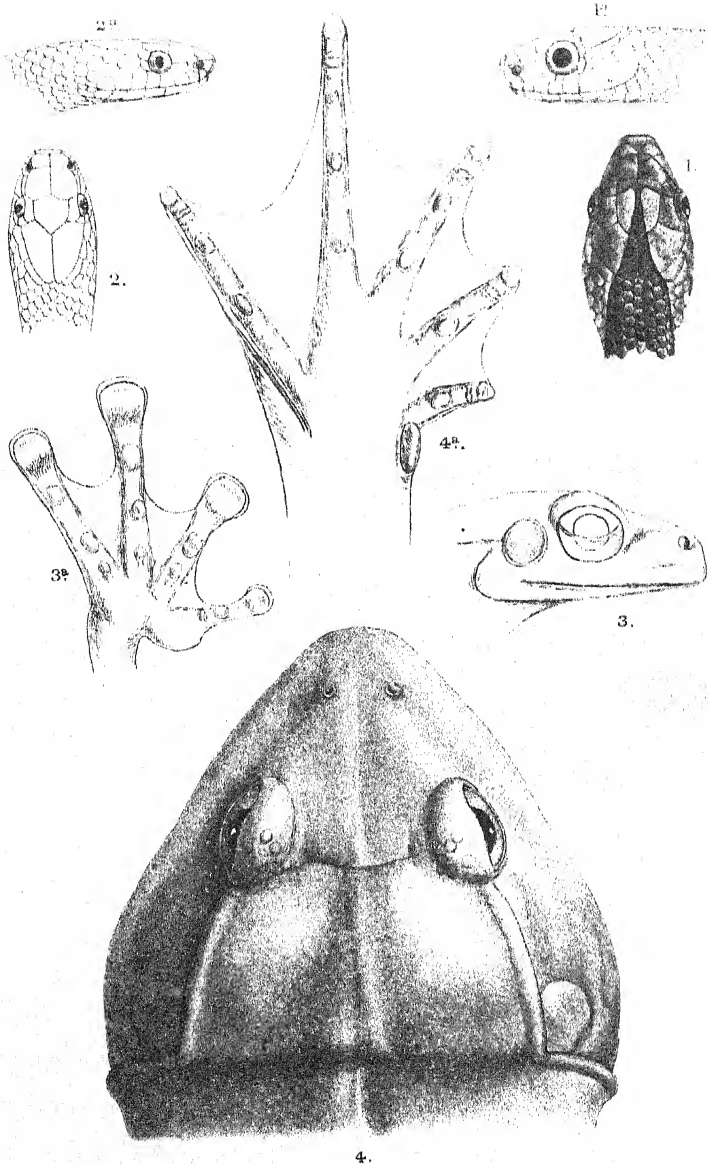
*Heteropelma igniceps*, Scl. P. Z. S. 1871, p. 750.

Three skins of this species were obtained by Mr. im Thurn on the Corentyn river (1879) and one on the Essequibo. The two former quite agree with my typical specimen; the latter has a rather paler crest, and is probably a female.

Mr. im Thurn tells me that this bird is common enough throughout the colony, not only near the coast, but also in the interior; on the Rupumini savannas, bordering on the Brazil, he has seen many examples.







R. Mintern del. et lith.

Mintern Bros. imp.

1. SIMOTES DENNYSI. 3. RHACOPHORUS DENNYSI.  
2. OPHITES SUBCINCTUS. 4. RANA MACRODON.

3. On a Collection of Reptiles and Frogs chiefly from Singapore. By W. T. BLANFORD, F.R.S., F.Z.S., &c.

[Received September 21, 1880.]

(Plates XX. & XXI.)

Through the kindness of Dr. N. B. Dennys, I have had an opportunity of examining a collection of Reptiles and Frogs made at Singapore, and belonging to the Raffles Museum at that port. The majority of the specimens were collected in the island of Singapore; but a few are from other localities; and in the case of some of the Lizards and Frogs, I am not quite certain whence they were originally obtained. Of all the Snakes (and these form the bulk of the collection) the localities are appended. The number of new species is small. It is evident that the Lizards and Frogs are but imperfectly represented; but the Snakes probably comprise, as I learn from Dr. Dennys, nearly all the forms occurring at Singapore.

The following is a list of the species; those on which remarks are added are distinguished by an asterisk (\*). The nomenclature is in most cases that employed by Dr. Günther in the 'Reptiles of British India.'

REPTILIA.

LACERTILIA.

*Hydrosaurus salvator*.

\*—, sp.

\**Eumeces chinensis*.

*Gecko guttatus*.

*Bronchocela cristatella*.

*Calotes versicolor*.

OPHIDIA.

*Typhlina lineata*. Macassar.

*Cylindrophis rufus*. Singapore.

\*— *lineatus*, sp. nov. Singapore.

*Xenopeltis unicolor*. Singapore.

\**Oxycalamus longiceps*. Singapore.

*Simotes octolineatus*. Singapore.

\*— *dennysi*, sp. nov. Singapore.

*Ablabes melanocephalus*. Singapore.

\**Nymphophidium subannulatum* (Odontomus subannulatus, D. & B.) Singapore.

*Composoma melanurum*. Singapore.

*Dendrophis picta*. Singapore.

— *caudolineata*. Singapore.

\**Ptyas mucosa*. Hongkong.

\*— *korros*. Singapore.

*Tropidonotus quincunciatus*. Hongkong.

— *trianguligerus*. Singapore.

— *stolatus*. Singapore, Hongkong.

\*— *rhodomelas*. Macassar.

*Cerberus rhynchops*. Singapore.

*Homolopsis buccata*. Singapore.

*Hipistes hydrinus*. Singapore.

*Chrysopelea ornata*. Singapore, Macassar.

*Tragops prasinus*. Singapore, Macassar.

*Dipsas cynodon*. Singapore, Sarawak.

— *dendrophila*. Singapore.

<i>Lycodon aulicus</i> . Singapore, Macassar.	<i>Callophis intestinalis</i> . Singapore, Macassar.
* <i>Ophites subcinctus</i> . Singapore.	<i>Platurus scutatus</i> . Singapore.
<i>Python reticulatus</i> . Singapore.	* <i>Hydrophis stokesi</i> . Singapore.
* <i>— curtus</i> . Singapore.	* <i>— viperina</i> . Macassar.
* <i>Naja tripudians</i> . Singapore.	<i>Pelamis bicolor</i> . Singapore.
<i>Ophiophagus elaps</i> . Singapore, Perak.	<i>Trimeresurus gramineus</i> . Singapore.
<i>Bungarus fasciatus</i> . Singapore.	<i>— erythrorus</i> . Singapore.
<i>— semifasciatus</i> . Hongkong.	* <i>— wagleri</i> . Singapore, Selangore.
<i>Callophis bivirgatus</i> . Singapore.	

## AMPHIBIA.

## BATRACHIA.

* <i>Rana macrodon</i> .	* <i>Rhacophorus dennysi</i> , sp. nov.
<i>Megalophrys nasuta</i> .	<i>Bufo melanostictus</i> .

## HYDROSAURUS, sp.

Two young specimens of *Hydrosaurus*, of nearly the same size (13 and 14 inches long), occur in the collection. One of these is an undoubted example of the common *H. salvator*; the other differs somewhat both in the character of the head-scales and in coloration. The general proportions and the scales of the body, tail, and limbs appear similar in the two examples; there are about 80 transverse rows of ventral shields between the gular fold and the loin in the specimen agreeing with *H. salvator*, 77 in the other.

The differences in coloration, taken by themselves, would not be of much importance, there being some variation in most Monitors. The doubtful specimen is darker; the alternating rings of dark brown and white on the tail are more broken up into rows of spots; and narrow white rings occur in the intervals between the broader bands, whilst the white cross bands above the snout and the dark cross bands on the chin are wanting; they are, however, indicated on the sides of the head.

The more important distinctions are that the scales on the crown of the head in the abnormal specimen are smaller and marked by a central depression, and the enlarged superciliary scales are more numerous, 8 to 10 in number, instead of 5 or 6, and marked with a few comparatively large impressed dots instead of several minute spots. How far these characters are constant it is impossible to say without more specimens. It is probable that the two specimens are from different localities.

## EUMECES CHINENSIS.

*Tiliqua chinensis*, Gray, Ann. Nat. Hist. ii. p. 289.

*Mabouia chinensis*, Günther, Rept. Brit. Ind. p. 83.

There is a single specimen, without locality, which must, I think, be referred to this species, though it presents several peculiarities.

The colour of the back is uniformly brown, there being no trace of the longitudinal pale bands usually found in this form; the præ-frontal is wanting; the two postfrontals are slightly unequal and divided by a curved line; they are in contact with the supranasal: this is probably an individual peculiarity. There are also but 22 series of scales round the body instead of 24; about 34 occur in a longitudinal line between the axils of the fore and hind legs as in the type; and, in other respects the specimen agrees with Chinese examples.

I am by no means sure that this form and its allies are really con-generic with *E. pavimentatus*, the type of the genus *Eumeces*. (See Peters, Monatsbericht Akad. Berl. 1864, p. 48; Stoliczka, J. A. S. B. 1870, xxxix. pt. 2, p. 174, and 1872, xli. pt. 2, p. 121; Anderson, P. A. S. B. 1871, xl. p. 181.) All these Scinks are very puzzling; and the generic distinctions accepted, such as the differences between smooth and keeled scales, transparent or scaly eyelid, presence or absence of supranasal shields, are scarcely of generic importance, and are merely convenient guides to identification.

*CYLINDROPHIS LINEATUS*, sp. nov. (Plate XX.)

Head depressed, broad, short, the width between the eyes being equal to the length from the eye to the tip of the snout. Each frontal is as broad as long. The vertical is longer than broad, sub-trapezoidal, the anterior margins meeting nearly at a right angle, the posterior termination slightly rounded. Supraorbitals longer than broad, each nearly equal in size to the vertical. Occipitals more than half as large as the vertical. Postocular very small, scarcely half the size of the first labial. Scales round the middle of the body in 21 rows. Ventrals, where widest, in the middle of the body, nearly twice the breadth of the scales on the sides; but the rows on each side of the ventrals are rather broader than the lateral and dorsal scales. Ventrals (from chin-shields to anal<sup>1</sup>) 215, two anals, subcaudals 9 besides the terminal scale.

*Back longitudinally banded.* A blackish-brown stripe, three scales wide, runs down the middle of the back from head to tail, and is bordered on each side by a narrower white band; below this again is a second, broad, blackish band of irregular width, with the lower border waved. This longitudinal band is separated by a narrow wavy white stripe from the transverse dark bands of the belly; the latter are wider than the alternating white bands; and, as in other species of the genus, the bands on the opposite sides of the abdomen do not precisely coincide. Head and tail yellowish white, with a few blackish spots.

Only a single specimen is sent. This measures 25 inches, of which the tail is 0.75 in. The Snake is probably rare.

*Cylindrophis lineatus* is distinguished from the three previously known species of the genus by its coloration, no other form exhi-

<sup>1</sup> It is difficult to say precisely where the true ventrals commence, as there is a gradual passage from the small scales immediately behind the chin-shields into the broader ventral shields.

biting longitudinal bands. It may be remarked that the distribution of colour appears to be very characteristic of the different forms of *Cylindrophis*. But there are also structural peculiarities by which the present form is separated from all previously described.

In the common species, *C. rufus*, all the head-shields are proportionally shorter, the frontals are broader than long, and the distance between the eyes more than the length of the snout. The ventral shields also are considerably less developed.

In *C. melanonotus* the vertical is still longer than in *C. lineatus*, the sides of that shield behind the lateral angles converging much less rapidly, and the occipitals are much smaller, each being barely half the size of the vertical. The coloration, too, is quite different, the back being uniformly dark brown.

In *C. maculatus*, the only other species known, the vertical, as in *C. melanonotus*, is bell-shaped instead of subtrapezoidal, and the occipitals are proportionally larger, being equal to the vertical in size; the frontals are sometimes longer than the vertical. The dorsal coloration consists of two rows of large pale spots, one on each side of the median dorsal line, the intervening space being dark brown.

The different species of the genus may be thus differentiated:—

- A. The width between the eyes is more than the distance from the eye to the end of the snout.
  1. *Cylindrophis rufus*. Back dark, with imperfect pale rings.
  2. *C. melanonotus*. Back uniformly dark-coloured.
- B. The width between the eyes is equal to the distance from the eye to the end of the snout.
  3. *C. maculatus*. Back with large pale spots on a dark ground.
  4. *C. lineatus*. Back longitudinally banded.

#### OXYCALAMUS LONGICEPS.

*Calamaria longiceps*, Cantor, J. A. S. B. 1847, xvi. p. 910, pl. xl. fig. 1.

*Orycalamus longiceps*, Günther, Rept. Brit. India, p. 199; Stoliczka, J. A. S. B. 1873, xlii. pt. 2, p. 120.

Two specimens of this Snake are sent; they measure 6½ and 7 inches respectively. The nasal shield is single, as noted by Cantor and Stoliczka; but it is divided by a suture below the nostril. Ventrals 143 in one, 128 in the other, subcaudals 19 and 25 pairs.

Both specimens have an imperfect pale collar a little behind the head; and one has a light spot on the hinder part of the fifth labial, extending to the occipital shield. Similar coloration is noted by Stoliczka in a Penang specimen.

#### SIMOTES DENNYSI, sp. nov. (Plate XXI. fig. 1.)

Scales in 21 rows. General form stout and short, as in *S. cochinchinensis*<sup>1</sup> and *S. catenifer*<sup>2</sup>; the head broader than the neck.

<sup>1</sup> Günther, Rept. Brit. Ind. p. 219, pl. xx. fig. C.

<sup>2</sup> Stoliczka, J. A. S. B. 1873, xlii. pt. 2, p. 121, pl. xi. fig. 3.

Rostral well developed; præfrontals more than half as large as postfrontals, the suture between the former but little shorter than that between the latter. Vertical large, pentagonal, the anterior margin convex, lateral edges converging slightly behind, posterior margins meeting at a right angle. Each occipital is both longer and broader than the vertical, and is rounded behind.

Loreal well developed, about as high as broad. Two (or three) præoculars, the upper double the size of the lower; two postoculars; temporals 2 + 3, the upper anterior temporal shield in contact with both postoculars; two elongate temporals along the outer side of each occipital. Upper labials 8, the seventh excluded from the margin of the lip, the fourth and fifth (or on one side the fifth only) entering the orbit. Two pairs of chin-shields, the posterior but little shorter than the anterior.

Ventral shields 175; anal undivided; subcaudals in 50 pairs, with a long terminal scale.

Back grey, with eleven dark-brown cross bands or large transverse spots on the body, and four on the tail, all having very irregular zigzag margins, and being, where widest, about half the breadth of the interspaces; the latter are slightly spotted and mottled with brown. On the head there is a broad dark cross band between the anterior parts of the eye-orbits on the front part of the vertical and on both pairs of frontals, and continued below the eye on the fifth and sixth supralabials. Behind this is a pointed elongated arrowhead-shaped dark mark, joining the anterior band on the vertical shield, and bifurcating behind on the neck; there is also an oblique band just behind the angle of the mouth. Belly whitish, with small quadrangular dark spots on the sides of every second or third ventral.

A single specimen is sent; it is only 8 inches long, the tail measuring  $1\frac{1}{4}$ .

This is another species of the peculiar group of *Simotes* comprising *S. cochinchinensis*, *S. brevicauda*<sup>1</sup>, *S. catenifer*, and *S. ancoralis*<sup>2</sup>. It is distinguished from all by having the seventh supralabial shield shut out of the lip-margin, and from all but the first by having twenty-one rows of scales. The coloration, too, differs somewhat from that of *S. cochinchinensis*, in which the lower parts are white.

#### NYMPHOPHIDIUM SUBANNULATUM.

*Odontomus subannulatus*, Dum. et Bibr. Erp. Gén. vii. p. 454; Jan & Sordelli, Icon. Oph. 36<sup>e</sup> livr. pl. v. fig. 3.

I had already identified the single specimen in the collection with the snake described by Duméril and Bibron, and figured by Jan<sup>3</sup>,

<sup>1</sup> Steindachner, Novara Rept. p. 61, pl. iii. figs. 13-14.

<sup>2</sup> Jan, Icon. Gen. Oph. 11<sup>e</sup> livr. pl. 6. fig. 2: see Stoliczka, J. A. S. B. 1873, xlii. p. 122.

<sup>3</sup> The specimen described by the first-named writers, the only one they had seen, was from the Leyden Museum; and as Jan's figure was taken from a snake belonging to the same collection, it is probable that the same individual was examined by both authors. The dimensions agree.

when Dr. Günther called my attention to the dentition, and suggested that the species might be a *Nymphophidium*. On comparing it with the type of *N. maculatum* in the British Museum, I found a close agreement in all essential characters; but some differences in the form of the head-shields and in the dentition show, I think, that the species are distinct.

The pupil in the snake now described is distinctly vertical; and this character is shown in Jan's figure of *Odontomus subannulatus*, although it is not mentioned in Duméril and Bibron's rather meagre description. From Günther's description of *Nymphophidium*, it might be inferred that the pupil is round, as it is in *Odontomus* as restricted by Günther; for the two genera are said to agree in every respect except dentition. On examining the type of *N. maculatum* in the British Museum, however, I find that the pupils are ill-preserved, and their form is not distinguishable; but in a second specimen, procured from Dr. Bleeker for the same collection, the pupil on one side is slightly elliptical. This very peculiar feature of a vertical pupil has consequently to be added to the generic characters. I find in the present specimen of *N. subannulatum* two peculiar small conical white tooth-like projections from the base of the skull, as in *N. maculatum*. They are easily seen at the back of the palate when the mouth is opened freely.

I add a description of the present snake, Duméril and Bibron's account being (as already noticed) imperfect.

*Description*.—Body and tail slender, compressed. Head much broader than neck, flat, depressed. Pupil elliptical, vertical. Scales of body but little longer than broad, smooth, in 15 rows. Ventrals 230, strongly angulate at the sides; anal undivided; subcaudals in 97 pairs. Maxillary teeth small and numerous, increasing slightly in size behind; the last is much larger and compressed, and projects horizontally backwards.

*Head-shields*.—Rostral broader than high, scarcely extending to the upper surface of the head. Anterior frontals as long as the posterior, rounded in front, scarcely broader than long. Posterior frontals much broader than long. Vertical elongate, the lateral margins converging and slightly concave, posterior angle acute; the length of the shield is but little less than that of an occipital; and the postfrontals and vertical together considerably exceed the occipitals in length. Nostril near the middle of a single rectangular shield, succeeded behind by another elongate rectangular shield (the loreal, or loreal and lower præocular united), which extends to the eye. A small præocular above the loreal, one postocular<sup>1</sup>. Temporals 2+2. Supralabials 7, the third and fourth enter the orbit.

*Colour* (in spirit). The anterior portion of the back dark brown, with subdistant pale cross bands, which become closer together

<sup>1</sup> In this character the specimen appears to differ from the type, which is figured with two postoculars. But on one side of the present example there is a well-marked groove, if not an imperfect suture, separating the lower posterior portion of the superiliary shield; and the postocular precisely corresponds to the inferior postorbital of the figure.



behind, and then intersect the dark areas, until on the posterior part of the back and tail there is a double row of brown spots. The white bands expand at the side, and, except near the head, bifurcate around a dark spot. Lower parts whitish. Head with a rather broad central dark band throughout the vertical and occipitals, and joined behind to the large brown spot on the back of the neck; the sides of the vertical and occipitals, with the greater part of the sides of the head and neck, are pale; but there is a dark patch on each superciliary shield, another on the temporals on each side, and the greater part of the snout in front of the eyes is dark brown.

Length of the specimen 13 inches, of which the tail is 3.1, or nearly one fourth.

The principal characters by which this form may be distinguished from *N. maculatum* are:—(1) The greater length of the vertical shield: in *N. maculatum* the vertical is much shorter than an occipital, the latter being equal in length to the vertical and postfrontals together; in *N. subannulatum* the vertical and postfrontals together are much longer than an occipital. (2) Dentition, there being only one larger tooth at the back of the jaw. In *N. maculatum* the nasals are described as separated by an indistinct suture; but I cannot detect with certainty a suture in the type; and in the second specimen the nasal is certainly undivided<sup>1</sup>.

I think it not impossible that the genus *Ulupe*, described by me<sup>2</sup> in 1878 from a Tenasserim specimen, is allied to *Nymphophidium*. *Ulupe* has but 13 rows of scales round the body, and there is no præocular above the elongate loreal; but in other respects the genus approaches *Nymphophidium* very closely. I am far from certain that I was right in assigning *Ulupe* to the *Lycodontidae*, to which, it should be remembered, *Odontomus* was referred by Duméril and Bibron, although Günther afterwards showed that the dentition differed from the *Lycodont* type.

#### PTYAS MUCOSA and PT. KORROS.

There are five specimens belonging to the genus *Ptyas*. One has 15 scales round the middle of the body, two have 16, and two 17; in the latter there are 3 loreals; all have the dorsal scales distinctly keeled on the posterior portion of the body. I refer the first three to *Pt. korros*, the latter two to *Pt. mucosa*; but I believe all to belong to one specific form and not to deserve to be distinguished, except as varieties. Since determining the specimens, I have ascertained that the individuals referred to *Pt. mucosa* are from Hong-Kong.

#### TROPIDONOTUS RHODOMELAS.

*Tropidonotus rhodomelas*, Boie, Isis, 1827, p. 535; Schlegel, Phys. Serp. i. p. 167, ii. p. 310, pl. xii. f. 10, 11.

<sup>1</sup> In Jan's figure of *Odontomus subannulatus* a suture is shown below the nostril, but not above. In the specimen examined by me there is on one side a slight groove below the nostril, but no suture.

<sup>2</sup> J. A. S. B. 1878, vol. xlvii. pt. 2, p. 128.

*Amphiesma rhodomelas*, Duméril & Bibron, Erp. Gén. vii. p. 737.

*Xenodon rhodomelas*, Günther, Cat. Snakes B. M. 1858, p. 58.

Three specimens from Macassar, one quite small, only 8 inches long, the other two 22 and 23½ inches in length. In all there are two præoculars, the lower being very small; one (the young) specimen has three, the other two have each four postoculars<sup>1</sup>. In one example there are eight supralabials on one side, the second being divided. The loreal is about as high as broad, but only the hinder part of the upper margin slopes downwards, and the form of the shield appears rather variable.

Ventrals 131, 133, and 134; anal divided; subcaudals 52 pairs in two specimens, 55 in the third. These numbers are a little higher than those given by Duméril and Bibron.

#### OPHITES SUBCINCTUS, var. (Plate XXI. fig. 2.)

Besides two normal specimens of this species, there is in the collection a young snake, 10¾ inches long (of which the tail measures 2), with smooth scales, and an undivided anal, but otherwise agreeing with *O. subcinctus*, and having the same peculiar arrangement of shields in the loreal region. In consequence of the scales being smooth, I at first took this for an undescribed species of the genus *Lycodon*, and had the accompanying figures of the head prepared, but subsequently amongst some snakes from province Wellesley in Malacca, collected by Mr. W. L. Distant, I found a much larger specimen of *Ophites subcinctus*, in which the keels of the dorsal scales were very faint in the hinder part of the body, and quite absent in the anterior portion. I therefore now consider the young Singapore snake an abnormal specimen of the same species.

#### PYTHON CURTUS.

*Python curtus*, Schlegel, apud Hubrecht, Notes from the Museum at Leyden, vol. i. p. 244<sup>2</sup>.

This is a very remarkable species of *Python*; and it is curious that it should so long have escaped notice, Hubrecht's description having only been published last year. The specimen in the Leyden Museum was from Sumatra.

*P. curtus* is remarkably stout for its length, its girth being proportionally much greater than that of *P. reticulatus* and *P. molurus*. The number of scales round the body is less, the ventrals and sub-

<sup>1</sup> Duméril and Bibron say one præ- and two postoculars. Schlegel represents one præ- and four postoculars; but the figure does not look very exact in this respect.

<sup>2</sup> In the 'Zoological Record' for 1877 there is the following notice:—"*Python curtus*, Schleg. Description and figure; A. Hubrecht, Ann. Mus. Leyd. No. 1." I learn that the work quoted has not been published; but a titlepage and, I believe, the figure and description of the present species were printed and a copy sent to the Recorder. In the 'Notes from the Museum at Leyden,' published in 1879, it is stated that the 'Annals,' which will contain a full description and figure of this species, will be published shortly.

caudals are considerably less numerous, and the tail is much shorter. The coloration, too, is different.

The following is a description of the specimen from Singapore:— Three pairs of frontals; vertical divided; enlarged irregularly shaped plates covering the occipital region. Nostril on the upper surface of the head, between two plates, the hinder of which is very small; a row of small scales extends from the nostril to the eye. Rostral and the two anterior upper labials on each side with deep elongate pits; ten upper labials; the fifth and sixth enter the orbit. Three or four of the anterior lower labials pitted; a longitudinal groove along most of the posterior lower labial shields.

Scales in 55 rows round the middle of the body, the series on each side of the ventrals being nearly half as broad as the latter. Ventrals 175; anal entire; subcaudals 32 pairs.

*Colour* (in spirit). The upper part of the head is uniformly earthy-grey, almost ash-grey, with a narrow pale median streak running back for some distance from the occiput; upper labials the same; a dark brown mark in front of the eye, continued behind the eye and expanding into a broad brown band, dark at the edges, and especially along the upper margin; this band runs down the side of the neck, and is succeeded by a row of large brown dark-edged spots along the anterior portion of the body. Back fawn-colour, with a row of rather irregular pale spots along the middle; below the fawn-coloured band and above the dark spots is a light belt with small dark brown spots on many of the scales. The coloration of the dorsal parts continues to the tail, which is dark brown above, light brown below, pale on the sides. Lower parts, except of the tail, white.

In the number of scales round the body, and of the ventrals and subcaudals, this form closely resembles the West-African *P. regius*; but that species, like the other African Pythons, has the nostrils laterally placed and the four anterior upper labials pitted, besides other differences.

The single specimen received, which is in magnificent condition, measures 55 inches in length, of which the tail is only 4; the girth round the middle of the body is 8.5 inches. A specimen of *P. reticulatus*, 67 inches long, has the tail 8.5 inches in length, and a girth of only 5.5 inches.

Dr. Denny writes to me that he has seen but two specimens of this *Python*, one of which escaped from its cage and was lost.

#### NAJA TRIPUDIANS.

Both the specimens in the collection are black throughout, without any marks on the back of the hood, but with some pale spots on the side of the neck and beneath it.

#### HYDROPHIS STOKESI.

Günther (Rept. Brit. Ind. p. 363) speaks of the occurrence of this species in the Chinese seas and the East Indian archipelago as doubtful. I think, however, that two specimens sent must be re-

ferred to this form, although they differ somewhat from the Australian types. One is a fine example, 64 inches long; the other is young, and measures but  $16\frac{1}{2}$  inches. Both have only 39 scales round the neck, instead of from 43 to 47; but I can find no other structural distinction, and a larger series would be necessary in order to show whether this difference is constant. The larger specimen has alternating black and yellow rings quite round the body; the younger has the black rings not quite perfect.

#### HYDROPHIS VIPERINA.

*Hydrophis viperina*, Günther, Rept. Brit. Ind. p. 378; Anderson, P. Z. S. 1872, p. 400.

The single specimen sent is 26 inches long. The colour differs but little from that of the much smaller type in the British Museum.

#### TRIMERESURUS WAGLERI.

There are two specimens of this Snake, 23 and  $32\frac{1}{2}$  inches in length. Both have 25 scales round the middle of the body. The prevailing colour in both is gamboge-yellow; the smaller has narrow yellow rings alternating with much broader bands composed of pale greenish scales with black margins; in the larger specimen the transverse bands are very indistinct, black scales, yellow scales, and black-edged scales being intermingled.

There is also a smaller *Trimeresurus*,  $17\frac{1}{2}$  inches long, with but 21 rows of scales round the middle of the body, grass-green above, with very minute subdistant spots, white in front, brown behind, about 5 or 6 scales apart from each other, arranged in a line down each side of the back. This agrees with *T. maculatus*, Gray, said by Günther, Rept. Brit. India, p. 388, to be the young of *T. wagleri*.

I find, however, in the British-Museum collection, specimens, chiefly from Borneo, that appear to show a gradation between these widely different forms. Two of the smaller specimens from Borneo, with the coloration of *T. maculatus*, have, the one 21, the other 22 scales round the middle of the body. It is evident the number in this species varies from 21 to 25, if *T. maculatus* is really the same as *T. wagleri*. In all adult or nearly adult specimens of the latter I find 25 rows of scales.

#### RHACOPHORUS DENNYSI, sp. nov. (Plate XXI. fig. 3.)

Size of *R. maximus*. Colour above, in spirits, dark violet, almost slaty, below dirty white mottled with dusky, a brown spot behind the occiput. The tympanum is very little smaller than the eye. The nostril opens backward. The web between the toes without dark spots and deeply emarginate; it extends to the pads at the end of all the toes of the hind feet; but it is very narrow near the end of the fourth toe on each side. *The fingers are incompletely webbed*, the web not extending to the end of any digit; the terminal phalanx of the third or longest digit is quite free. The projection on the inside of the inner finger is flat as in *R. reinwardti*, and has not a tubercle beneath it as in *R. maximus*. Folds along the edges of

the limbs inconspicuous. The length of the manus from the wrist to the tip of the longest finger is nearly equal to the width of the head. Vomerine teeth in two straight ridges, nearly in the same right line; the distance of the two series apart is scarcely more than half the length of each series; the ridges commence from the anterior inner margins of the inner nostrils.

	inches.
Length of head and body .....	4.5
„ hind limb from anus to end of longest toe	6.75
„ foot .....	2
„ hand .....	1.45

This species much resembles the East-Himalayan and Assamese *R. maximus*, which it equals or excels in size; but the tympanum is proportionally twice as large, and the webs of the feet are less developed (they are shorter in the fore feet of *R. maximus* than in those of *R. reinwardti* or *R. malabaricus*). From *R. reinwardti* the new form is distinguished by size, coloration, and by the fingers being imperfectly webbed.

The single specimen sent, Dr. Dennys informs me, was of a beautiful emerald-green colour when alive, and belonged to a well-known Chinese merchant named Whampoa, who refused an offer of five hundred dollars for it. When the animal died, it was presented to the Raffles Museum. It is said to have originally come from China; but the precise locality is not known.

In the smaller forms of *Rhacophorus*, the development of the folds of skin along the sides of the limbs and above the anus is very remarkable. Mr. Wood-Mason called my attention to this in the case of *R. maculatus* (and I find the same in *R. reinwardti*), and noticed that this form shows a passage towards the curious Flying Frog of Borneo figured by Wallace in the 'Malay Archipelago,' vol. i. p. 60.

#### RANA MACRODON. (Plate XXI. fig. 4.)

I am indebted to M. Boulenger for the identification of this species. The specimens differ considerably from the descriptions given by Duméril and Bibron<sup>1</sup>, and by Günther<sup>2</sup>, both of whom describe the tympanum as small. This character, however, is, I learn from M. Boulenger, more variable than has hitherto been supposed; and as there is, in the British Museum, a specimen from Java, the original locality of the species, that agrees with those from Singapore, I accept M. Boulenger's opinion. The following is a description of the Singapore specimens.

Head very broad and flat—the breadth across the gape being greater than the distance from gape to muzzle, and equal to the length of the hind foot in females, exceeding it by one eighth to one tenth in males. Snout depressed, rounded at the end; no trace of *canthus rostralis*; the nostrils near the end of the snout and distant from the eye, their distance apart being about half of the in-

<sup>1</sup> Erp. Gén. viii. p. 382.

<sup>2</sup> Brit.-Mus. Cat. Batr. Sal. p. 8.

terval between nostril and eye. Eye of moderate size, the diameter about equal to the length of the fourth finger. Tympanum distinct, nearly as large as the eye. Lower jaw with two prominent apophyses in front, fitting into hollows inside the upper jaw; in a female sent these apophyses are inconspicuous. Vomerine teeth on two straight ridges running obliquely back from the interior angle of the inner nostrils, and converging behind so as to meet, if prolonged, nearly in a right angle, but rather widely separated; a strong osseous transverse ridge behind the choanæ. No vocal sac. A strong fold from behind the eye running horizontally to over the tympanum, then turned down at an obtuse angle and running to the shoulder. Posterior portion of upper eyelid tubercular. Skin of body and limbs smooth. Limbs stout, the tips of both toes and fingers slightly swollen; the distance from vent to knee is about half the length of the body from snout to vent or a little more; from vent to metatarsal tubercle is longer than the body. The metatarsal tubercle is elongate, not flattened. The toes are scarcely fully webbed; the terminal two phalanges of the fourth toe have only a narrow fringe along their sides, and the web is deeply emarginate; a narrow fold along the inside of the foot.

Colour (in spirits) light brown above, one specimen (a male) having a pale stripe down the back, very little paler below, the sides and lower portion of the limbs, the sides of the body, breast and chin marbled with rich brown.

	♂ inches.	♀ inches.
Length from nose to vent .....	6	4.9
„ of head .....	2.6	1.7
Breadth of head .....	3.15	2.2
Length of hind leg .....	8.6	7.5
„ hind foot .....	2.65	2.15

Three specimens are sent—two apparently males, the third a female. I believe all were obtained at Singapore; but I have not heard positively that this was the case.

This form is closely allied to *Rana fusca*<sup>1</sup>, but has a much broader head; the eye is smaller, and the tympanum larger; the muzzle is flatter, the nostrils nearer together, and the web between the toes of the hind feet much less developed.

In the specimens of *R. fusca* from Penang, described by Stoliczka, there does not appear to be any passage towards the Singapore form; for the toes are said to be fully webbed. Mr. Boulenger informs me that he considers *R. fusca* also a variety of *R. macrodon*.

In the Journal of the Asiatic Society of Bengal for 1879, vol. xlviii. pt. 2, p. 130, I described a supposed new species of *Hypsirrhina* under the name of *H. maculata*. I overlooked the fact that this name had previously been given by Duméril and Bibron to the Chinese species *H. bennetti*. Under these circumstances I propose to change the name of the Burmese form to *Hypsirrhina maculosa*.

<sup>1</sup> Blyth, J. A. S. B. xxiv. 1855, p. 719 (the volume is wrongly quoted by Anderson as xxxiv); Theobald, "Cat. Rept.," J. A. S. B. 1868, extra number, p. 79; Anderson, P. Z. S. 1871, p. 197; Stoliczka, J. A. S. B. 1873, xlii. pt. 2, p. 115.

## EXPLANATION OF THE PLATES.

## PLATE XX.

*Cylindrophis lineatus*, sp. nov., p. 217; with outlines of head-shields, from above.

## PLATE XXI.

Fig. 1. *Simotes dennysi*, sp. nov., view of head, p. 218; from above.

1a. ———, outline of head-shields, side view.

2. *Ophites subcinctus*, var., p. 222; outline of head-shields, from above.

2a. ———, var., outline of head-shields, side view.

3. *Rhacophorus dennysi*, sp. nov., p. 224; side of head.

3a. ———, fore foot, from below.

4. *Rana macrodon*, p. 225; head.

4a. ———, hind foot, from below.

All the above figures are of the natural size, except 1, 1a, 2, and 2a, which are double the real dimensions.

4. An Account of the Collection of Lizards made by Mr. Buckley in Ecuador, and now in the British Museum, with Descriptions of the new Species. By the late A. W. E. O'SHAUGHNESSY, Esq., Assistant in the Natural-History Departments, British Museum.

[Received January 19, 1881.]

(Plates XXII.-XXV.)

Of the zoological collections made by Mr. Buckley in Ecuador, various sections of which have already formed the subjects of papers in these 'Proceedings,' not the least interesting is the collection of Lizards, both on account of the number of new species it reveals, and because of the fresh materials it affords for the study of those already known. I have given a partial notice of this collection (P. Z. S. 1880, p. 491), confined, however, to a preliminary list of the species of *Anolis* identified, and the description of a beautiful new one. I now offer the results of a study of the whole collection, and have thought it advisable not to restrict the present paper to the description of the new forms, but to enumerate all the species, for the purpose of recording additional remarks and revisions which have appeared necessary, and of thus making this contribution to the Herpetology of Ecuador as complete as possible. A much earlier collection, that of Mr. Fraser, afforded Dr. Günther the opportunity, in 1859, of describing and figuring a series of reptiles from the same region (P. Z. S. 1859, p. 89); and his paper has, of course, been frequently referred to.

I may point out that the family Cercosauridæ, our knowledge of which, so imperfect before Prof. Peters's admirable memoir in 1863, had scarcely been increased since that date, has received some remarkable accessions in the present collection; also that the genus *Enyalius* has been further worked out, whilst a new form of the curious genus *Hoplocercus* has been brought to light.

The specimens were collected at three distinct stations:—viz. Canelos, Pallatanga, and Sarayacu.

#### TEJIDÆ.

##### 1. CENTROPYX DORSALIS, Günther.

*Monoplocus dorsalis*, Günther, P. Z. S. 1859, p. 401.

*Centropyx pelviceps*, Cope, Pr. Ac. Phil. 1868, p. 98.

? *Centropyx altamazonicus*, Cope, J. Ac. Phil. (n. s.) viii. 1876, p. 162.

Two specimens, the largest measuring about 11½ inches long, from Canelos. Another good-sized specimen, from the Peruvian Amazons, is also in the British Museum. By its keeled præanal scutes this species would be the *C. altamazonicus*, Cope, rather than his *C. pelviceps*; but I am inclined to think that the very small specimen on which the former is founded will prove identical with the latter. If so, both must be referred to the species described by Dr. Günther, also on a small type specimen, in which, after renewed examination, I do not find that the distinctions relied on by Prof. Cope when describing *C. pelviceps* hold good, as I count fourteen longitudinal series of ventrals in the middle of the body, and can also distinguish femoral pores. The largest specimen from Canelos has the sixteen ventral series characteristic of *C. altamazonicus*, though that species shows them already in a young specimen. I may add that Dr. Günther's type possesses the anal spurs of this genus.

##### 2. NEUSTICURUS ECIPLEOPUS.

*Neusticurus ecipleopus*, Cope, J. Ac. Phil. 1876, p. 161; O'Shaugh. Ann. N. H. ser. 5, vol. iv. p. 295 (1879).

Pallatanga.

#### CERCOSAURIDÆ.

*Emminia olivacea* of Gray is a *Cercosaura*, as was rightly surmised by Dr. Peters in 1863; moreover it is so closely related to *Cercosaura ocellata*, Wagler, that nothing but the conspicuous lateral ocelli and the three additional femoral pores of that species separate them. With regard to the præanal scutes, I may mention that another specimen from Para, which, some time since, I had occasion to add to the named series in the British Museum, has the two large plates figured by Peters as belonging to Wagler's species, instead of the four smaller marginal plates of Gray's type; but on this ground alone I should not venture to separate it from *C. olivacea*, with which it agrees exactly in every detail. It is perhaps superfluous to state that no foundation for the peculiar position assigned to the nostril by Dr. Gray is afforded by the specimen.

A similar variability in the arrangement of the præanal scutes, associated with an irregularity in the plates of the muzzle, is shown in a series of four specimens, which, however, cannot be specifically distinct, and are doubtless referable to the species described by Prof.



Peters as *Cercosaura* (*Pantodactylus*) *argulus*. Although the number and arrangement of the præanal scutes affords a conspicuous and important character in the family Cercosauridæ, and in many cases a reliable one, sufficing, for instance, to distinguish several species of *Leposoma* from the original one of Spix, and from the new one recently described by Prof. Peters, allowance must be made for a certain amount of variation in this particular, more especially as corresponding variations in other characteristic portions of the scutellation are to be found in the Lizards of this and closely allied South-American groups.

I have already noticed that the internasal plate is sometimes entire and sometimes bisected in *Neusticurus ecpleopus*, Cope, although this species was described by Prof. Cope as differing from *N. bicarinatus*, L., in having it entire (see 'Ann. N. H.' Oct. 1879, p. 295). I found also in *N. bicarinatus* an irregular additional præfrontal plate associated with the cleft internasal. In the present series of specimens of *Cercosaura* (*Pantodactylus*) *argulus*, the internasal has a longitudinal cleft in a line with the suture of the fronto-nasals, and occasionally the above-mentioned supernumerary plate is present in exactly the same position as in *Neusticus bicarinatus*. The fronto-nasals are in that case reduced to smaller triangular and more lateral plates, quite separated from each other, instead of being large and extensively in contact. These two forms of arrangement of the nasal shields are associated with two distinct types of præanal scutellation. One specimen with the additional præfrontal has four narrow marginal præanals; another with the normal nasal plates has only two large rounded marginal præanals, like *Cercosaura ocellata*, while the others have the normal nasals and the four narrow marginal præanals.

As Prof. Peters had only a single specimen from Bogota, and those in the present collection from Ecuador show a range of variation within recognizable specific limits, I give the following supplementary description:—

3. *CERCOSAURA* (*PANTODACTYLUS*) *ARGULUS*, Peters, Abh. Ak. Berl. 1863, p. 184, pl. i. fig. 3.

Internasal broad, single, or bisected in a line with the suture of the two good-sized fronto-nasals when these are extensively in contact; sometimes an intermediate small præfrontal joining the frontal and the internasal. Frontal and fronto-parietals of the ordinary shape, interparietal large, flanked by two large parietals, and followed by a small occipital enclosed between two good-sized postoccipital plates. Nasal rather large, followed by a single large frenal. Supralabials six, none particularly elongate; infralabials five, the third very elongate. Two pairs of large postmentals in contact, the third smaller, separated by the group of large and small intervening gular scales. Two contiguous rows of larger plates to the chest, where a small collar is formed by a central and two lateral rounded plates. Some convex scales behind the occiput; scales of the back not very narrow, keeled, pointed, the keels being slightly produced; on the

sides small quadrate scales, in two rows to each of the dorsal rows. Ventral plates large, in six longitudinal series, the middle ones squarish, the outer rounded. Præanal scutes four or six, arranged as described above. Four series of square, smooth, inferior caudal plates; those above elongated, keeled, without points. Tail generally with a lateral groove. Femoral pores six to nine.

Above light brown; head variegated with darker. A central dark longitudinal stripe and a lateral one on each side, beneath which a light vitta extends from the temporal region the whole length of the side, again bordered inferiorly with black. Sides with a series of eight or nine large ocelli black with white centres; another, pure white, lower lateral stripe from the labials and beneath the eye. Entire ventral surface yellowish; each ventral, anal, and lower caudal scute with a central black dot. Tail above and below light brown or yellowish, the dorsal tints fading and the stripes ceasing over the ramp.

	millim.
Total length .....	102
Distance of tip of snout from ear-opening..	12
"        "        "        fore limb ..	18
"        "        "        vent .....	43
Length of fore limb .....	15
"        fourth finger on fore limb.....	4
"        hind limb .....	20
"        third hind toe .....	4½
"        fourth hind toe .....	5½

Beside the other differences noted above, Prof. Peters's type specimen showed only two anterior lateral ocelli. Its locality is given as the mountain region of Santa Fé de Bogota. Of the four collected by Mr. Buckley in Ecuador, one is from Pallatanga, and three are from Canelos.

4. *CERCOSAURA* (*PANTODACTYLUS*) *RETICULATA*, sp. n. (Plate XXII. fig. 1).

Internasal broad, fronto-nasals pentagonal, with one side in contact; frontal short; fronto-parietals separate; interparietal long and straight; parietals also with straight inner edge, broader than the interparietal, and rounded externally; these three plates evenly truncate on the posterior line of the head, and followed by two transverse rows of small plates, preceding the regular scales of the nape, there being no true occipital shields. Head-shields smooth, without any ridges. Supraorbitals three. One frenal. Supralabials seven, none of them elongate; infralabials six. Temporal scales irregular, polygonal, rather large. A single mental shield behind the symphysial, and four pairs of postmentals, the two first in contact, the others separated by narrow intervening scales. A double series of large gular shields ending in the very indistinct collar before the chest. Scales of the entire upper surface and sides of the body very narrow, elongate, and keeled, of the same type as those of *C. schreibersii*,

but narrower. Sides of the neck and shoulder granular. Ventral shields smooth, in eight longitudinal series, long, narrow, and distinctly rounded posteriorly. Four principal præanal shields—two median, with their points touching, and two lateral. Tail continuing the scutellation of the back and ventral surface, with a distinct groove along the side. Second and fifth toes on fore foot nearly equal; fourth a little longer than the third.

Brown, variegated with black on the head, with close longitudinal series of light black-edged ocelli or of light spots, in a black longitudinal stripe on the back and sides of the body. Labials and chin-shields spotted with black. Tail pale yellowish brown. Entire undersurface yellowish.

	millim.
Total length .....	114
Distance from tip of snout to ear-opening. .	10
"    "    "    fore limb ..	18
"    "    "    vent .....	43
Length of fore limb .....	11
"    fourth front toe. ....	3
"    hind limb .....	18
"    third hind toe .....	4
"    fourth hind toe. ....	6

This species has the dorsal scutellation characteristic of the subgenus *Pantodactylus*; but, as before remarked, the dorsal scales are still narrower than in *Cercosaura schreibersii*, and more like those of *C. argulus*, Peters, figured in 'Abh. Ak. Berl.' 1863, pl. i. fig. 3. The narrow rounded ventral scales are a peculiar feature; and so also is the arrangement of the parietal head-shields, which is like that of the genus *Leposoma*.

One specimen from Canelos.

#### CERCOSAURA, subg. n. PRIONODACTYLUS.

Characters of *Cercosaura* and of the section *Pantodactylus*. Toes of both fore and hind feet strongly toothed beneath.

##### 5. CERCOSAURA (PRIONODACTYLUS) MANICATA, subg. et sp. un. (Plate XXII. fig. 3.)

A single broad internasal, two fronto-nasals in contact, the rest of the plates on the upper surface of the head as in *C. schreibersii*, the interparietal being somewhat shorter. A single frenal, a large triangular præocular over the labials, and another similar cauthal plate before the supraorbitals. Six supralabials, the third, fourth, and sixth elongate, continued in a series of longish smooth plates in the same line as far as the ear-opening; only four infralabials, the third extremely elongate. A single broad mental plate behind the symphysial, followed by two pairs of contiguous posterior plates, a third pair being widely separated and forced into a lateral position by two converging groups of large oval gular scales, the central and lateral gular spaces being occupied by smaller rounded scales; a

double row of very large broad plates, increasing in size posteriorly, leading to the chest.

Sides of the neck and of the body anteriorly granular. Back covered entirely with elongate narrow, strongly keeled scales, sharply pointed posteriorly, in about eighteen longitudinal rows in the middle of the body, and giving place to much smaller scales on the sides. Ventral shields large and smooth, the middle ones square, the lateral ones rounded, in six longitudinal series, with an additional small external series on each side. Three posterior very long præanal shields, the middle one very narrow and straight, the two outer ones broader and rounded. Lower caudal plates smooth, the upper ones, continued from the back, keeled. Limbs with large scutes on the anterior surfaces, as in other Lizards of this group.

Fourth toe on the anterior limb a little longer than the third. The scales beneath the toes with tooth-like projections; so that all the toes on both fore and hind feet are strongly pectinate.

Femoral pores twelve.

Dark greenish above (in spirits). The sides black, forming a broad and well-defined stripe from the sides of the head to the tail, bounded inferiorly by a narrow pure white stripe from the rostral to the hind limb. A very remarkable pure white patch covers a part of the fore limb, including the first, second, and third toes, and reaching up the wrist and along the anterior scutes of the inner surface of the arms to the elbow. Another isolated white patch is seen on the fore part of the upper arm, near the body. The rest of the front or upper surfaces of the fore limb are dark brown, black in the vicinity of the white patches, and including the two remaining toes. The hind limbs are paler brown, with faint coloured ocelli. Lower surface of the entire Lizard yellowish white, becoming bluish on the belly. The upper surface of the trunk is variegated with dark spots and a distinct zigzag pattern of light and dark brown extends the whole length of the tail. The white lateral vitta on the head is rendered more conspicuous by a short inferior streak of black along the labials, and by the lower symphysial plate being black against the white of the adjacent plates.

	millim.
Total length .....	137
Distance from tip of snout to ear-opening..	16
"        "        "        eye .....	6
"        "        "        fore limb ..	29
"        "        "        vent .....	70
Length of fore limb .....	25
"        fourth front toe.....	6
"        hind limb .....	36
"        fourth hind toe.....	10
"        third hind toe .....	8

Characters which render this species at once conspicuous are the peculiar white markings and the toothed undersurface of the toes. The latter feature seems sufficient at once to distinguish the present

form from all the allied ones with which I have the means of comparing it. As in all other respects it is a *Cercosaura*, and would, on account of its narrow elongate keeled dorsal scales, belong to the subgenus *Pantodactylus*, from which it must be separated in consequence of this peculiarity of the feet, I have formed a new subgenus *Prionodactylus* for its reception.

Three rather large specimens from Canelos, and one from Pallatanga.

6. *LEPOSOMA*<sup>1</sup> *CARINICAUDATUM*.

*Lepidosoma carinicaudatum*, Cope, J. Ac. Phil. viii. 1876, p. 160.

Two good-sized specimens of this very striking species from Pallatanga and two from Canelos.

7. *LEPOSOMA* *BUCKLEYI*, sp. n. (Plate XXII. fig. 2.)

Rostral plate and symphysial plate of lower jaw broad, especially the latter. A single internasal one third broader than long; two transverse fronto-nasals with their points in contact; frontal moderate-sized, triangular in front, truncated behind, longer than broad; two fronto-parietals; the interparietal and two parietals are three longish straight plates, nearly equal and uniform, evenly truncated behind at the limit of the occipital region, and without any intervening occipital plates. These three plates have their edges raised, forming longitudinal ridges on the hinder portion of the head; and the tendency to rugosity extends also to the fronto-parietals. Four supraorbitals. Two narrow oblique frenals. Five supralabials; one, extremely long, beneath the anterior part of the eye. Four infralabials. A single mental, followed by three pairs of large plates, those of the first two pairs in contact, the third being separated by smaller irregular-shaped plates, which go semicircularly round towards the angle of the mouth.

Temporal scales convex. Ear-opening large, rounded in front, truncate behind. Sides of neck to shoulder also covered with round convex scales. The whole upper surface from the parietal plates, and the sides of the body between the fore and hind limbs as far as the abdomen, covered with elongate lanceolate keeled scales, the points projecting. From the regular plates of the postmental region, uniform triangular pointed scales cover the whole of the space as far as the chest, where they form a very indistinct collar not continued into any transverse fold on the side of the neck. Scales on the chest and anterior part of ventral surface also pointed like those of the throat; middle and posterior abdominal scales square, in eight longitudinal series. Two small anterior and two large posterior præanal scutes, some smaller ones at the sides. Upper surface of limbs with keeled scales. Toes of fore limb very short, the inner one minute, the third a little shorter than the fourth. Tail with strongly keeled scales above, like the back, the keels showing a

<sup>1</sup> See Prof. Peters's recent rehabilitation of the old Spixian form of this name, 'M.B. Ak. Berl.' 1880, p. 217.

tendency to form ridges; those on the lower surface of the tail are also keeled. Femoral pores fourteen.

	millim.
Total length . . . . .	115
Distance from tip of snout to ear-opening. .	12
"    "    "    fore limb . .	21
"    "    "    vent . . . . .	50
Length of fore limb . . . . .	15
"    fourth front toe. . . . .	4
"    hind limb . . . . .	23
"    third hind toe . . . . .	6
"    fourth hind toe. . . . .	7

Upper surface pale brown, with a longitudinal row of black spots in middle of back. A light lateral stripe from the supraorbital angle, along the parietal border and extreme edge of the dorsal surface, to the tail. Sides of body black, variegated with blue or yellowish spots on the neck. Entire mental region yellowish, without spots. A dark coloration predominates over the whole inferior surface of the throat (beginning from the last postmentals), of the body, limbs, and tail. The scales are blackish at their root or for half their length, and yellowish at the tips.

A single specimen from Canelos.

This is a third species of the genus *Leposoma*, bearing a resemblance to *L. carinicaudatum*, Cope, in the pointed and carinate scales, and also in the large præanal scutes, in which both species differ from the *L. scincoides*, Spix, as figured by Peters in 'Abh. Ak. Berl.' 1862 (1863), pl. 2. fig. 1. It has very much smaller scales, however, than the former species, in all the specimens of which I count only nineteen round the body, while in the present there are not less than thirty-four. This great difference is made by the scales on the sides being much smaller in the species under consideration, while in *L. carinicaudatum* they are uniform with those of the back. *L. dispar*, recently described by Prof. Peters, is evidently quite different, being more nearly allied to *L. scincoides*.

*Loxopholis rugiceps*, Cope, must be a Lizard very similar to both of these species; and I am unable to see how its scutellation differs generically from that of *Leposoma* as represented by *L. carinicaudatum*, in which Professor Cope describes "four abdominal rows of scales with the keels reduced to an angle and mucro," consequently smooth. The abdominal scales are quadrate in the species which I have now described; and this character appears to be the only one that was left to the genus *Loxopholis* when Prof. Cope described *Leposoma carinicaudatum*.

Having carefully compared the Lizard brought by Mr. Buckley from Ecuador with the description of *Loxopholis rugiceps*, I find that the internasal plate is much longer in that species, the præfrontals more extensively in contact, and the scales much larger, being intermediate between those of *L. carinicaudatum* and the present species (twenty-four round the middle of the body). Moreover the

keels of the tail are stronger below than above, and the coloration is quite different.

8. *ECPLEOPUS* (*EUSPONDYLUS*) *GUENTHERI*, sp. n. (Plate XXIII. fig. 1).

Form slender and elongate. Head rather narrow, not constricted at the nape, muzzle rather long. Internasal plate large, longer than broad, rounded in front, followed by two large, irregular, four-sided fronto-nasals extensively in contact on their inner or smaller side; frontal, two fronto-parietals, and large moderately broad and long interparietal, two wedge-shaped parietals; two occipitals behind the interparietal, smaller outer occipitals and paroccipitals above the temporal region, the shields of which are polygonal and large. Nasal large, triangular, with the nostril in the middle; frenal also large, obliquely cut off posteriorly by the first and largest of a series of rather large infraoculars. Supraorbitals four. Supralabials six, not elongate; infralabials five, the first unusually smaller and wedge-shaped. Symphyseal very large; single mental followed by two pairs of large contiguous postmentals; a third with their points almost meeting, and a wide concavity behind occupied by the gular scales, of which there are three rows before the minute gular collaret, and seven between this and the last gular series of eight narrow and long shields which form the collar. All these series are continuous with those of the nape, forming complete rings of smooth quadrangular plates, there being no granular space on the neck, and only a limited space covered with small or minute, but not granular, scales at the shoulder and fore part of the side. Back with cross rows of elongate quadrangular smooth shields, about fourteen or fifteen in each row. Small or minute lateral shields of the same type run up between the dorsal rows. Thirty-four transverse dorsal rows from the occiput to the root of the tail. Ventral shields elongate, quadrangular, smooth, in ten longitudinal series (counting the smallest external ones in the middle of the body), in twenty-one transverse rows from the collar to the anal region. Præanal plates two large anterior, five long posterior ones. Tail with the dorsal and ventral scutellation. Limbs covered almost entirely with large smooth plates, leaving only a very limited space occupied by small scales on the posterior surfaces. Femoral pores eight. Fore limb reaching to front of eye; third and fourth toes equal. Hind limb reaching three fourths of the length of the side; fourth toe the longest. The inner toes are well developed on both fore and hind feet.

Ground-colour of the entire dorsal surface uniform pale brown, with dark bars and spots disposed as follows:—Each of the shields on the upper surface of the head has one or more round blackish spots; eight broad transverse bars on the back between head and root of tail; the bars are continued at equal intervals on the tail, diminishing to mere spots towards the end. Lower surface of body and tail yellowish, also with round blackish spots, generally one on each plate on the anterior portions (the gular and labial regions in particular) being large, variegated with the dark colour, distinct bars

descending from the eye across the labials to the chin. Limbs also spotted. No lateral or longitudinal stripes.

	millim.
Total length .....	194
Distance from tip of snout to ear-opening. .	20
"    "    "    fore limb. . . . .	37
"    "    "    vent. . . . .	92
Length of fore limb .....	27
"    fourth toe .....	9
"    hind limb .....	40
"    fourth hind toe .....	14
"    third hind toe .....	11

A single fine specimen from Sarayacu.

This fine and conspicuous species is related to *Ecpleopus* (*Euspondylus*) *maculatus*, Tschudi; and as regards the principal characters of the head-shields, and gular and anal scutellation of that species figured by Prof. Peters, does not exhibit any marked differences. Tschudi's figure of the entire Lizard indicates, however, a very different general appearance, more like that of *Proctoporus fraseri*, O'S., based by me on a specimen formerly confounded with *E. maculatus* in the British Museum, but differing from it in the absence of fronto-nasals. The present species of *Euspondylus* presents a remarkable likeness to the *Gerrhonoti* named *Elgaria* by some authors. Amongst other points of difference apparent from a comparison with the descriptions of *Euspondylus maculatus* of Tschudi and Peters, it would appear that the very well developed series of infraoculars is not distinct in Tschudi's species as figured by Peters, also that the scales are smaller, and that a longitudinal black stripe on the side of the neck is very characteristic of *Euspondylus maculatus*, while there is no such stripe in the Lizard before us, nor indeed any markings distributed longitudinally. Moreover the black dorsal bars are very different from the quadrangular black spots described by Tschudi, and distinguish it at once from all other Lizards of this group.

#### 9. ECPCLEOPUS (EUSPONDYLUS) STRANGULATUS, Cope.

*Ecpleopus* (*Euspondylus*) *strangulatus*, Cope, P. Ac. Phil. 1868, p. 99.

This curious species, so different from all its congeners, is well represented in Mr. Buckley's collection, there being numerous specimens from Canelos, two from Pallatanga, and one from Sarayacu.

#### SCINCIDÆ.

##### 10. MABUYA ÆNEA (Gray).

*Tiliqua ænea*, Gray in Griff. An. King. ix. (Synopsis) p. 70; Ann. N. H. ser. 1, ii. p. 292.

*Mabouya cepedii*, id. Cat. Lizards in B.M. p. 95.

*Eumeces mabouia*, Dum. & Bibr. Erp. Gén. v. p. 646.



*Copeoglossum cinctum*, Tschudi, Fauna Peruana, Herpetol. p. 45, pl. 3. fig. 2.

*Mabouia unimarginata*, Cope, Proc. Ac. Phil. 1862, p. 187.

Two from Pallatanga, one from Sarayacu, and two from Canelos.

Professor Peters fixed the synonymy of Tschudi's Lizard in 1871, M.B. Ak. Berl. 1871, p. 400. It is easily recognizable from the figure in the 'Fauna Peruana.' Prof. Peters then suggested its probable identity with *Mabouia cepedii*, Gray. I may as well take this opportunity to remark that there is in fact no difference between the single specimen so named in Gray's Catalogue and *M. anea* (the name for this common species which apparently has the priority).

#### GECKOTIDÆ.

##### 11. THECADACTYLUS RAPICAUDA (Houltuyn).

*Thecadactylus rapicaudus*, Gray, Cat. Liz. B.M. p. 146.

Two specimens from Canelos.

##### 12. GONIODACTYLUS CONCINNATUS, sp. n. (Plate XXIII. fig. 2.)

Granulation very fine all over the upper and lateral regions of the head and body, and on the gular surface, larger only on the muzzle and on a small anterior space immediately behind the mental plate, where the granules give place to rounded or polygonal scales. Labial plates large and few in number, four upper and lower, the fourth being very small in each case. Mental shield large; no post-mental, two of the rounded anterior gular scales a little larger than the others behind it. Scales of the entire lower surface of the body rather large, oval or rounded, beginning on the throat between the chest and the ear-opening. Tail with broad transverse plates beneath. Head and fore part of body above and below as far as the shoulder, and including the fore limb, pale brown or yellowish, abruptly terminated by two vertical humeral bands, sometimes meeting above and forming a regular collar of pure white with black borders. The rest of the body, with the hind limb, blue, with black vermiculations elaborately interwoven; tail darker, with the variegations continued. Inferior surface from chest blue, paler again at the hind limb and anal region.

	millim.
Total length .....	80
Distance of end of snout from ear-opening ..	10
"    "    "    fore limb ..	20
"    "    "    vent .....	45
Length of fore limb .....	18
"    fourth front toe .....	5½
"    third front toe .....	5
"    hind limb .....	24
"    fourth hind toe .....	7
"    third hind toe .....	6

Three specimens from Canelos.

This *Goniodactyle* is very conspicuous from its coloration. The variegation of the back is something like that seen on the head only in *Goniodactylus ocellatus*, Gray, from Tobago, which seems to have remained unnoticed since the acquisition of the single type in the British Museum. The present species, from Ecuador, is quite different from that described by Dr. Günther as *Gymnodactylus caudiscutatus*, P. Z. S. 1859, p. 410, which has a round ocellus at the shoulder, but no vertical stripe.

13. *GONIODACTYLUS BUCKLEYI*, sp. n. (Plate XXIII. fig. 3.)

The granulation resembling that of the preceding; the scales of the belly also similar. Mental large, and with two rounded gular scales behind, but no distinct postmental. Six supralabials, five infralabials. Tail with broad inferior scales.

Ground-colour greyish brown. Head variegated with black; back with two parallel longitudinal rows of black blotches, pointed in front, and separated by the median line. A narrow white vertical streak on the shoulder. Gular region, from the chin to the chest, with alternating black and white oblique stripes converging behind, and making a triangular pattern.

	millim.
Total length .....	83
Distance from end of snout to ear-opening ..	11
"        "        "        fore limb ..	20
"        "        "        vent .....	47
Length of fore limb .....	18
"        third front toe .....	4
"        fourth front toe .....	5
"        hind limb .....	21
"        third hind toe .....	5
"        fourth hind toe .....	6

One specimen from Pallatanga and two from Canelos.

This species offers most similarity to *G. fuscus*, but does not possess the large postmental plate to which attention has been drawn by M. Bocourt.

IGUANIDÆ.

14. *ENYALIS LATICEPS*.

*Enyalis laticeps*, Guich. Casteln. Voy. Amér. du Sud, Rept. p. 20, pl. 5 a, b; Dum. Arch. Mus. viii. p. 529.

*E. planiceps*, Guich. op. cit. p. 21, pl. 6, a, b.

A single specimen, 13½ inches in length, from Pallatanga.

This is the first example of the above species received by the British Museum, as those referred to it by Dr. Günther in 1859 do not really belong to it.

15. *ENYALIS MICROLEPIS*, sp. n. (Plate XXIV. fig. 2.)

Head broad, rounded, its width just before the ear-opening being nearly equal to its length from the tip of the snout to the occiput;

covered above with small convex and pointed scales closely set: larger scales forming the inner supraorbital border, and a strongly projecting superciliary border of square uniform and equal scales continuous with the canthus rostralis, about 13 from the nostril above the orbit, or from 18 to 21 in the entire series. Three large conical scales behind these at the hinder angle of the orbit; groups of large conical scales above the temporal region, round the anterior edge of the ear, and in an isolated patch on the side of the neck. Labial shields 12, equal. A crescentic row of about twelve infraoculars. Scales of the back and sides of the body very small. A median dorsal crest of large conical scales, beginning behind the occiput, and diminishing on the anterior part of the tail; the highest of these scales are much less than the vertical diameter of the ear. A single lateral series of similar but much smaller scales along each side of the body from the shoulder to the fore part of the tail; below this the scales of the side are minute and granular; above it the dorsal scales are minute but in regular rows up to the dorsal crest, pointed and distinctly keeled; scales of sides of gular region strongly keeled; gular region as far as the chest with very convex erect scales closely set; scales of the entire ventral surface, including the chest, strongly keeled, those of the limbs also keeled. Tail compressed, with complete rings of larger scales alternating with spaces in which the scales are very small; a double series of projecting scales above; all the scales on the inferior surface large and keeled. A single femoral pore on each side. Mottled and variegated with dark brown on a yellowish ground; brown-tinged on the tail, or greenish, with a brown network on the sides. Gular region blackish or dark blue (in the male). Entire ventral surface yellowish. An isolated yellow spot on each side of the neck. In young specimens a yellow lateral stripe on the neck.

	millim.
Total length .....	160
Distance from tip of snout to ear-opening .	30
"      "      "      fore limb....	55
"      "      "      vent.....	113
Length of fore limb .....	60
"      third finger .....	15
"      fourth finger.....	16
"      hind limb .....	86
"      third toe .....	16
"      fourth toe.....	24

Two specimens from Sarayacu.

Besides these, there were already in the British Museum three specimens collected by Mr. Fraser in Western Ecuador, which Dr. Günther mentioned as *E. laticeps*, P. Z. S. 1859, p. 407.

The species now described approaches *E. heterolepis*, Bocourt (Ann. Sc. Nat. [5] xix. Art. No. 4, and Miss. Sc. Mex. iii. livr. 4, pl. 20 c. fig. 14), but differs from it in the much smaller size of the

scales and in the single lateral series of large scales. M. Bocourt's description particularizes "deux rangées longitudinales de chaque côté de la crête dorsale;" and his figure of the general scutellation of the sides indicates about 29 scales vertically between the belly and the dorsal crest, and larger scales intermixed with these everywhere.

Sexual characters are well shown in the series of specimens before me.

The male has a larger head and longer hind limbs, reaching to the eye, while in the female they do not extend beyond the tympanum. A different system of coloration also prevails, the female being of darker brownish and more variegated tints and without the dark gular patch.

16. *ENYALIUS PRÆSTABILIS*, sp. n. (Plate XXV. fig. 1.)

Head broad, with rounded and projecting lateral border of about 20 canthal and superciliary scales in a continuous series, almost uniform in shape and size. Entire upper surface of the head covered with very convex or pointed and erect scales, larger in the crescentic series bordering the supraorbital region; larger conical scales above the temporal region. Supralabials 10, infralabials 9, uniform. Gular scales convex, elongate, the central erect. The back and sides of the body are covered with small almost uniform pointed and keeled scales, from 34 to 40 in a vertical series between the abdominal scales and the dorsal crest. Only a single very indistinct lateral series of larger scales on each side. A longitudinal crest of conical erect scales from the nape, along the median line of the back, and continued anteriorly on the tail, where it gives place to a double row or keel of pointed scales. Scales of the ventral surface small, uniform, smooth on the chest, and very feebly keeled on the middle of the abdomen; of the limbs small and keeled. A single femoral pore in a large scale on each side. Tail compressed, ringed with small keeled scales on the sides and larger beneath.

Female with a shorter head than the male, and considerably larger scales on the sides of the body. The male also has the tail much thicker at its root and longer hind limbs, reaching to the eye, while those of the female reach only to the anterior border of the ear-opening.

Ground-colour of the upper regions of the body, in the male, reddish, very finely speckled with green; posterior gular region and gular fold black; lower surfaces yellowish. The female has the ground-colour above dark brown, thickly dotted over with green; tail brown- and yellow-ringed; lower surfaces yellowish, without gular patch. A yellow spot on a patch of conical scales behind the ear in both sexes.

	millim.
Total length (of male) . . . . .	318
Distance between end of snout and ear-opening. .	34
"                    "                    "          fore limb . .	56
"                    "                    "          vent . . . . .	126

	millim.
Length of fore limb . . . . .	161
„ third finger . . . . .	17
„ fourth finger . . . . .	18½
„ hind limb . . . . .	197
„ third toe . . . . .	17
„ fourth toe . . . . .	27

This very handsome species differs from *E. heterolepis* in having the scales on the sides of the body much smaller and scarcely intermixed with larger ones, also in the smooth or very feebly keeled scales of the lower surface, in which, amongst other points, it differs also from *E. microlepis*.

Two specimens, male and female, nearly equal in size, from the localities Pallatanga and Canelos.

#### 17. ANOLIS (DRACONURA) CHRYSOLEPIS.

*Anolis (Draconura) chrysolepis*, Dum. & Bibr. Erp. Gén. iv. p. 94; Guichenot, Casteln. Voy. Amér. Mérid. ii. p. 15, pl. iv. f. 1; Bocourt, Miss. Sc. Mex. iii. p. 99, pl. 16. f. 26.

*Anolis nummifer*, O'S. Ann. N. H. ser. 4, xv. p. 278.

Two specimens from Canelos, and one from Pallatanga, which show the characteristic coloration figured by Guichenot.

It is as well to state with regard to this species that the single specimen referred to it by Dr. Gray in his Catalogue is a *Nerops auratus*, and that it is consequently only rather recently that we have in the British Museum possessed specimens correctly (as I believe) referred to this species.

In regard to the species which I have described as *Anolis nummifer* (Ann. N. H. ser. 4, xv. p. 278), I now entertain considerable doubts whether it is more than a variety of this same long-established *A. chrysolepis*, two distinct systems of coloration in which have been pointed out by M. Bocourt. Putting the entire series of specimens together, I now find great variation of colour, but no substantial differences but what are either sexual or within the possible limits of a species. They all have the narrower toes characteristic of *Draconura*. Another specimen, a female, which I now therefore refer to *A. chrysolepis*, was collected by Mr. Buckley at Canelos.

N.B. I may state, with reference to Prof. Cope's remarks on my identification of his *A. vittigerus* with *A. biporcatus*, that a renewed examination on the present occasion of the specimens named by him in the British Museum only confirms me in my view, and that M. Boulenger, to whom I have shown them, also agrees with me.

A variety, which must be the *A. bivittatus*, Hallow., with lateral longitudinal stripes, is well represented in this series.

#### [ANOLIS PUNCTATUS.

*Anolis punctatus*, Daudin, Rept. iv. p. 84, pl. 66. fig. 2; Dum. & Bibr. Erp. Génér. iv. p. 112.

*Anolis gracilis*, Neuw. Abbild. zur Nat. Brasil. pl. vii. f. 2, Reise, ii. p. 131.

*Rhinosaurus gracilis*, Gray, Cat. Brit. Mus. p. 199.

*Anolis nasicus*, Dum. et Bibr. Erp. Génér. p. 115.

The British Museum possesses a single specimen of *A. punctatus* from Rio Janeiro, which shows the slight differences from *A. nasicus* indicated in the descriptions of Duméril and Bibron. Of this latter species there are also four examples, all males, while the other is a female. I cannot resist the conclusion indicated in the above revised synonymy, in which, of course, the older name of Daudin takes precedence.]

The fine specimen in Mr. Buckley's collection which I formerly named *A. nasicus* (P. Z. S. 1880, p. 491) does not really belong to that species, only superficially resembling it, and is apparently an undescribed one, which I have pleasure in naming after my friend M. Boulenger:—

18. *ANOLIS BOULENGERI*, sp. n. (Plate XXIV. fig. 1.)

Head elongate; muzzle raised; præfrontal space concave; anterior upper portions of head covered with rounded or polygonal scales, moderate-sized, slightly convex on the muzzle, flat on the frontal region. Orbital semicircles of very large scales, separated on the vertex by the interorbitals, which have dwindled to one or two very small scales in a single series. A central group of large supra-orbitals surrounded by small rounded or polygonal ones. A single long anterior supraocular continuous with the long canthal scales. Occipital plate large, rounded, very little longer than wide, larger than the ear-opening. Six series of frenals. Seven supralabials; eight infralabials, with large scales in several rows beneath. Scales of the entire upper surface and sides uniform, minute, granular; those of the ventral surface very small, rounded, and distinctly carinate. Toes with broad dilatations. Tail long.

Bright green, with round pearl-like white spots in transverse rows on the back and sides. Lower parts yellowish.

	millim.
Total length .....	280
Length of snout to the eye .....	11
Distance from tip of snout to ear-opening ....	21
"    "    "    fore limb .....	35
"    "    "    vent .....	79
Length of fore limb .....	32
"    third and fourth front toes .....	8
"    hind limb .....	57
"    third hind toe .....	9½
"    fourth hind toe .....	14

From Canelos. This species shows a remarkable analogy to *A. punctatus* in the shape of the head, proportions of the body and coloration, the white spots being very similar. It is, distinguished, however, by the keeled ventral scales, those of *A. punctatus* being flat and smooth. A peculiarity which I have remarked in all the

specimens, both male and female, of the latter species, is a median longitudinal groove on the belly from behind the præanal region, the scales bordering the groove on each side being enlarged.

#### 19. *ANOLIS FUSCO-AURATUS*.

*Anolis fusco-auratus*, D'Orbigny, Voy. Amér. Mérid. Rept. pl. 3. fig. 2; Dum. & Bibr. Erp. Gén. iv. p. 110; Bocourt, Nouv. Arch. Mus. 1869, vi. Bullet. p. 15; id. Miss. Sc. Mex. iii. pl. 14. figs. 16, 16a.

*Anolis viridiæneus*, Peters, M.B. Ak. Berl. 1863, p. 147.

One specimen, a female, from Pallatanga.

#### 20. *ANOLIS BUCKLEYI*.

*Anolis buckleyi*, O'Shaughnessy, P. Z. S. 1880, p. 492, pl. 49.

The two specimens of this beautiful species obtained by Mr. Buckley have already been described.

#### 21. *ANOLIS BOUVIERI*.

*Anolis bouvieri*, Bocourt, Miss. Sc. Mex. iii. p. 58, pl. 14. fig. 8.

Two specimens, apparently of this species, from Pallatanga and Canelos. M. Bocourt's type was from Guatemala. Specimens already identified by me in the British Museum as *A. bouvieri* are from Pebas and from Guayaquil. The one from the latter locality is that enumerated by Dr. Günther as *A. æneus* in his list of Mr. Fraser's collection (P. Z. S. 1859, p. 89). *Anolis æneus*, Gray, however, cannot be looked upon as a species, since the single specimen on which it appears to have been founded proves to be only a young *Anolis alligator*, D. & B. See O'Shaughnessy, Ann. N. H. ser. 4, vol. xv. p. 272.

#### 22. *LEIOCEPHALUS ACULEATUS*.

*Leiocephalus aculeatus*, O'Shaughnessy, Ann. N. H. ser. 5, vol. iv. p. 303 (1879).

Four additional specimens from Canelos and Pallatanga afford me the opportunity of giving some further particulars about this remarkable species. On each side of the occiput are some erect scales, forming a flag-like border. These curious scales, which are not conical, are present in both sexes, and appear characteristic of the species, as they are not seen in *L. iridescens* nor, of course, in the species of the genus with small cephalic shields.

The sexes are very distinct. The male is of much darker coloration, as previously described, and has the whole gular region deep black. It has also the tail covered with very large scales, and very strongly compressed, almost resembling *Basiliscus* in this respect. The female has the back light brown, with triangular bars of darker pointing backwards. The sides below the lateral crest are dark brown, sharply separated from the lighter hue of the back. The tail is compressed at the root only, rounded afterwards. This species would belong to the same section of *Leiocephalus* as *L. herminieri*, D. & B., which also has the ventral scales keeled. That

species is unrepresented in the British Museum, as Bibron's supposition of its identity with *L. carinatus* appears to have been incorrect, although very confidently expressed. The description indicates, however, a cephalic scutellation totally different from the present species, a very much higher crest, and other conspicuous points of difference. The scales on the top of the muzzle in the present species are quite large, only about 10 in number, and not keeled, instead of the 30 very small keeled ones mentioned by Bibron.

### 23. *LEIOCEPHALUS TRACHYCEPHALUS*.

*Leiocephalus trachycephalus*, Dum. Cat. Méth. Rept. 1851, p. 70; Arch. Mus. viii. p. 539, pl. 23. fig. 1.

One specimen from Sarayacu, Ecuador. There are now numerous specimens in the British Museum which I have recognized as of this species; the figure of the entire lizard, however, evidently a very bad one, shows little resemblance to them.

### 24. *HOPLOCERCUS ANNULARIS*, sp. n. (Plate XXV. fig. 2.)

Scales on snout convex, granular, similar and nearly uniform on the other parts of the head, excepting the supraorbital spaces, where they are larger and rounded or polygonal. The upper surface of the body is covered with a groundwork of small granular scales, with tubercles in several complete longitudinal rows from the nape to the root of the tail, more closely set along the median line of the back; series of tubercles also descend vertically on the sides. Scales of the belly rather small, but regularly tessellated. Supralabials nine. Infralabials ten. Limbs strongly tubercular. Tail longer than head and body, cylindrical, and surrounded at regular and rather close intervals throughout its entire length by complete rings of projecting tubercles or spinous scales. A series of two or three very large femoral pores on each thigh. Teeth trilobate.

Brown, with transverse dark bars on the back. An oblique yellow black-bordered stripe in front of the fore limb. A large yellow spot on the upperside of the thigh.

	millim.
Total length .....	132
Length of head to ear-opening .....	16
Distance from tip of snout to fore limb .....	27
"                    "            vent .....	59
Length of fore limb .....	24
"          third and fourth fingers .....	8
"          hind limb .....	40
"          fourth toe .....	14

A single specimen, evidently young, as shown by an external groove indicating imperfect symphysis of the lower jaw, was obtained from Canelos. It is a very interesting form, which, on account of the total dissimilarity of its tail, might have been separated generically from *Hoplocercus spinosus*. I can, however, detect no other grounds for such separation; and as I have lately found a



precisely analogous case in the Agamidæ, in which I felt loth to create an artificial genus, I have acted in the same way in the present instance. The *Uromastix princeps* recently described by me (P. Z. S. 1880, p. 445) has an abnormally flattened spinous tail of extraordinary appearance, but somewhat like the tail of *H. spinosus*. It consequently differs from the other species of *Uromastix* with long verticillated tails, in just the same way as *H. spinosus* differs from the present species. In other respects these two species are so similar that it is difficult to draw up a complete specific diagnosis of the new one. There are, however, fewer labial shields; and the limbs are considerably longer, the hind ones reaching to the front of the ear, while in *H. spinosus* they reach only to the shoulder.

25. *PLICA UMBRA*, Gray.

One young specimen from Pallatanga.

26. *URANOCENTRUM FLAVICEPS*, Guichenot.

One adult and two young from Canelos, and one adult from Sarayacu in Ecuador. There is a locality of the same name (Sarayacu) in Peru.

27. *URANISCODON UMBRA*, Kaup.

A single specimen from Sarayacu, Ecuador.

EXPLANATION OF THE PLATES.

PLATE XXII.

Fig. 1. *Cercosaura* (*Pantodactylus*) *reticulata*, p. 230.

- 1 a. ——— (——) ———, head above.  
 1 b. ——— (——) ———, dorsal scutes.  
 1 c. ——— (——) ———, ventral scutes.

2. *Leposoma buckleyi*, p. 233.

2 a. ———, half undersurface.

2 b. ———, scales of back.

3. *Cercosaura* (*Prionodactylus*) *manicata*, p. 231.  
 3 a. ———, under surface of fingers.

PLATE XXIII.

Fig. 1. *Eupleopus* (*Euspondylus*) *guentheri*, entire, p. 235.

2. *Goniodactylus concinnatus*, p. 237, entire.

3. ——— *buckleyi*, p. 238, entire.

PLATE XXIV.

Fig. 1. *Anolis boudengeri*, p. 242.

1 a. ———, head from above.

2. *Engalius microlepis*, p. 238.

PLATE XXV.

Fig. 1. *Engalius præstabilis*, p. 240.

1 a. ———, scutellation of side.

2. *Hoplocercus annularis*, p. 244.

5. Description of a new Species of *Enyalius* in the Brussels Museum. By G. A. BOULENGER.

[Received January 19, 1881.]

(Plate XXVI.)

In a paper on the collection of Reptiles made in Ecuador, and presented to the Brussels Museum by Consul Emile de Ville, I have mentioned<sup>1</sup> a specimen of *Enyalius*, which I identified with *E. heterolepis*, Bocourt, noticing, however, that the dorsal crest was more elevated in my specimen than in the typical one. Having reexamined the former, and compared it with examples of the two beautiful species just described by Mr. O'Shaughnessy, viz. *E. microlepis* and *E. prestabilis*, I am now convinced that it belongs to a distinct, hitherto undescribed species, which I have the pleasure of naming

*ENYALIUS OSHAUGHNESSYI*, sp. n. (Plate XXVI.)

Head broad and rounded, once and two thirds as long as broad, covered with subquadrangular strongly keeled scales, those on the canthus rostralis and the superciliary border a good deal larger and projecting. A small but distinct occipital plate. Loreal region concave, with small, irregular, keeled scales. Temporal region with small convex scales, above with a series of large conical ones; a few large conical scales near the tympanum. Labial shields 14, equal. Scales of the back and sides of the body small, smooth and slightly keeled, irregularly intermixed with larger but not conical ones. A median dorsal crest of very large conical scales, beginning behind the occiput, and gradually diminishing in height to the base of the tail, where it becomes double and soon vanishes; the highest of these scales on the neck measure more than the vertical diameter of the ear-opening. A single lateral series of conical scales on each side of the back, beginning at a small distance from the head and extending to the sacral region. There are 14 rows of scales between the dorsal crest and the lateral series, and 30 between the latter and the belly. Scales on the limbs strongly keeled. Scales of gular region keeled; those of the pectoral and ventral regions as large as those upon the limbs, and strongly keeled. A single femoral pore on each side. Tail compressed, with verticillate, strongly keeled scales, the verticilli composed of five or six rings of increasing size; scales of the lower surface equal and also strongly keeled.

*Coloration* (in the single male specimen). General colour dark brown; throat and some of the scales of the sides of the body and tail and some of the limbs greenish; a light rounded spot on each side of the neck, behind the ear; gular fold black.

<sup>1</sup> Bull. Soc. Zool. France, 1880, p. 43.

9. On the Land Shells of the Island of Socotra collected by Prof. Bayley Balfour. By Lieut.-Colonel H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c. Part I. Cyclostomaceæ.

[Received January 18, 1881.]

(Plates XXVII., XXVIII.)

For the recent exploration of the Island of Socotra we are very greatly indebted to Mr. Sclater, who from the first so strongly advocated the examination of its flora and fauna. This work has been most ably carried out by Prof. Bayley Balfour, who volunteered his services, and who, after a necessarily short stay there of only six weeks in the cold season of 1880, brought away with him a fine store of specimens. The present paper is based on a study of the land- and freshwater Mollusca thus obtained.

It is proposed to bring out this list in two parts, instead of waiting until the whole collection has been examined and compared. The first contribution, now submitted, comprises the Cyclostomaceæ. As a whole, they are, as might have been expected, African and Arabian in character, the connexion being certainly, as regards the operculated forms, more Arabian than African. The collection contains a number of very distinct, fine and interesting forms, of which some were already known, but many are new and considerably extend the list of Socotran species. The large area of limestone formation on the island is especially favourable to the existence of these creatures, while island-conditions have, as usual, modified and increased the species of some genera. I hope to be able to show to what extent the species are allied to the adjacent continental forms—always so interesting a point as regards island faunas. The Helicidæ number about twenty species, the operculated species ten, while there are some eight freshwater, or a total of about forty. It is remarkable to note that there is not a single true *Helix* represented in the collection: one specimen I did at first think was a *Helix*; but it is in a very imperfect state, and on further examination appears to belong to the Buliminæ.

Species of Buliminæ are the most numerous among the Helicidæ, the greater numbers being allied to Mr. G. Nevill's subgenus *Achatinelloides*, which is closely allied to a group which extends through Arabia and Persia to N.W. India.

Of the genus *Otopoma*, represented in Socotra by six species, there is found in the neighbouring island of Abd-el-Goury *O. modestum*, Petit, which is not in the collection and appears to be peculiar to that island, as also *Cyclostoma gratum*, a genus not represented in the collection.

It is interesting to note how restricted *Otopoma* is to Arabia and the islands off the east coast of Africa. The only exceptions are:—*O. albicans*, Sow., in the British Museum, given as from the island of

Hainan, China, according to Benson<sup>1</sup>, but which possesses all the characteristics of the Socotran shells, and must be, I consider, wrongly labelled; there is also one recorded from the continental shore of Mogadox, viz. *O. guillani*; and we have an outlier in one species on the other side of the Arabian Sea in peninsular India, *O. hinduorum*, recorded from Kattiawar and named by Mr. W. T. Blanford.

Again, in *Cyclotopsis*, a genus belonging to the Cyclostomidae, but with a multispiral operculum, we find the connexion of Socotra not with Africa but with peninsular India on the one side, where it is represented by *C. semistriatus*, and in the far south-east, in the Seychelles, by another species: this has been already pointed out by Mr. W. T. Blanford in a paper (Ann. & Mag. Nat. Hist. 1864) "On the Classification of the Cyclostomaceæ of Eastern Asia," and more recently (in the same publication, 1876) "On the African Element in the Fauna of India."

*Lithidion*, again, follows a very similar distribution, with the exception of India, all the species being East-African island forms, though not extending southward beyond Madagascar. On the north it is found in Arabia, but has not, I believe, been recorded from the African coast, which, however, has been little explored.

*Tropidophora* is a purely Madagascar genus, where it has reached its maximum of development and beauty in some magnificent shells; and it occurs in most of the East-African islands, viz. Mauritius and Rodriguez,—in the first represented by the very rare *T. barclayana*, and in the second by *T. articulata*. *Tropidophora* we now find spreading as far north as Socotra; but this genus has never been found in India.

Judging from the land-molluscan fauna of Socotra, there is strong evidence that the island was once directly connected with Madagascar to the south. We know the great antiquity of that island; and it is not unreasonable to suppose that in Socotra, the Seychelles, Madagascar and Rodriguez we have the remnants of a very ancient more advanced coast-line on this western side of the Indian Ocean, which line of elevation was probably continuous through Arabia towards the north. With an equally advanced coast on the Indian side, the Arabian Sea would, under these conditions, have formed either a great delta, or narrow arm of the sea into which the line of the Indus and Euphrates drained. Such conditions would have admitted of the extension of species from one side to the other, which the later and more extensive depression of the area, as shown in Scinde, afterwards more completely shut off.

#### OTOPOMA NATICOIDES. (Plate XXVII. figs. 1, 1 a.)

*Cyclostoma naticoides*, Récluz, Rev. Zool. 1843, p. 3.

Shell globosely turbinate, very solid; sculpture well marked transverse irregular lines of growth crossed by distant indistinct spiral sulcation. Colour white, fine orange within the aperture. Spire rather high, the extreme apex generally decollate. Whorls

<sup>1</sup> Sowerby in his original description gives no locality.

5, well rounded. Aperture obliquely and broadly ovate, angular above, suboblique. Peristome thick and solid, particularly on the columellar margin, where it spreads out and completely conceals the umbilicus; this is a greater development and exaggeration of the angulate notch which is to be seen in the next two species from this island. Operculum situated well within the aperture, flatly concave in front, shelly, smooth, of about  $3\frac{1}{2}$  whorls, nucleus sub-central.

Size of largest specimen—major diam. 59.5, minor diam. 5.1, alt. axis 31.5 millims. Largest size given by Pfeiffer—major diam. 41.0, minor diam. 34.0, aperture  $19 \times 16$  millims.

Example figured—

major diam. 2.15, minor diam. 1.7, alt. axis 1.35 inch.

„ „ 54, „ „ 42.5, „ 34.0 millims.

Small var.—

major diam. 38, „ „ 30.7, „ 18.5 „

„ „ 1.32, „ „ 1.0, „ 0.53 inch.

Animal not yet examined.

[“Very common on the limestone plains from more than one locality.” (I. B. B.)]

*O. guillani*, Petit, is a small form, diameter 26 millims., very similar in the expansion of the columella-notch over the umbilicus, from Mogadoxa on the N.E. coast of Africa, 250 leagues distant from Socotra.

#### OTOPIOMA BALFOURI, n. sp. (Plate XXVII. figs. 2, 2 a.)

Shell globosely turbinate, solid, very openly umbilicated, ribbed regularly and spirally throughout; but the ribbing does not extend within the umbilicus; colour white; spire pyramidal, decollate usually for  $1\frac{1}{2}$  whorl; suture well impressed; whorls 4, well rounded; aperture subvertical, ovoid, angular above; peristome continuous, solid, and reflected slightly on the outer margin, less solid on the columellar side, which presents a slight dentation with angularity just below the upper inner margin, well rounded below.

Size:—

Major diam. 55.0, minor diam. 40.0, alt. axis. 22.0 millims.

„ „ 2.16, „ „ 1.58, „ 0.87 inches.

Dwarf var.

major diam. 32.8, „ „ 26.5, „ 14 millims.

[“Common on the land towards the east end of the island: this portion is elevated over 700 feet and is of limestone.” (I. B. B.)]

This species is very close to *O. auriculare*, Gray, of which the habitat is unknown, but the columellar margin is more expanded and the ribbing is coarser and more distant than in *O. balfouri*.

*Cyclostoma albicans*, Sow., apud Gray, Zool. Beechey's Voy. pl. xxxviii. fig. 30, p. 146, is said to inhabit some of the islands of the Southern Pacific, which I do not believe is correct. The description agrees with this shell; but no dimensions are given, and the

inferior figure represents a shell with a high spire, not nearly glo-  
bular : it is certainly not to be identified with Sowerby's figure in  
the Thes. Conch. pl. xxvi.

*OTOPOMA COMPLANATUM*, n. sp. (Plate XXVII. figs. 3, 3 a.)

Shell turbate, openly umbilicated, fine spiral ribbing crossed  
by transverse finer ribbing, smooth on base; colour white; spire  
pyramidal,  $1\frac{1}{2}$  whorl at the apex smooth; suture impressed;  
whorls 5, sides well rounded; aperture ovate, suboblique, angular  
above; peristome continuous, thickened and scarcely reflected on  
the outer margin, which is well rounded; columellar margin oblique  
to axis, thin, with a well-marked submedian angulation near the  
umbilicus, but with no tendency to an expansion in that direction.

Size :—

Major diam. 36·8, minor diam. 29·5, alt. axis 16·8 millims.

["Very common on the limestone plains from more than one  
locality, and common on the land towards the east end of the island;  
all the land in this region is elevated over 700 feet and is of lime-  
stone." (I. B. B.)]

Somewhat like *Cyclostoma albicans*, Sow. Thes. Conch. p. 118,  
pl. xxvi. figs. 110–112, in form of the aperture and its smooth surface.

*OTOPOMA CLATHRATULUM*, var. *SOCOTRANA*. (Plate XXVII.  
figs. 4, 4 a.)

Shell very globosely turbate, closely umbilicated, spiral ribbing  
on the apical whorls crossed by transverse striation, becoming  
smoother on the body-whorl, which only shows the latter; colour  
white, also pale purple, stronger on the apex; bordering the suture  
in one specimen numerous pale purple bands of colour occur, show-  
ing darkish above the periphery (fig. 4 a); spire pyramidal, suture  
impressed; whorls 4, well rounded; aperture subvertical, oval,  
angulate above; peristome continuous, almost separated from the  
penultimate whorl, not reflected, thickened on the outer margin;  
columellar margin suboblique, nearly straight, with only a very  
slight tendency to angulation. Operculum shelly, situated close to the  
peristome, paucispiral, of three whorls rapidly increasing, nucleus  
subcentral, flat in front.

Size :—

Major diam. 28·5, minor diam. 22·6, alt. axis 13·5 millims.

" " 1·22, " " 0·88, " 0·55 inch.

["Very common everywhere." (I. B. B.)].

This species is very closely allied to *O. clathratulum*, Récluz, figured  
in Conch. Icon. pl. xviii. fig. 116 b; but in none of the Socotran shells  
do we find the columellar margin expanded, as seen in Mr. Sowerby's  
drawing; and I have examined the specimens in the British Museum:  
fig. 116 a is that of a well banded specimen, but is much over-  
coloured. Both Arabia and Socotra are given as the habitat of this  
species; but there is some doubt as to which locality the above speci-  
mens are to be assigned to, as they are stuck upon the same tablet.

*OTOPOMA CLATHRATULUM*, var. *MINOR*.

Shell closely umbilicated, very globosely turbinate, solid, polished, sculpture regular spiral ribbing, crossed by fine transverse irregular costulation; colour white, one specimen dark grey on the apex; spire conoid, apex blunt, and smooth for  $1\frac{1}{2}$  whorl; whorls  $4\frac{1}{4}$ ; aperture ovate; peristome simple, strong, and attached close to the penultimate whorl. Operculum situated close to the peristome, very thick and shelly, the subcentral nucleus slightly sunken below the outer whorl; dark grey in central portion.

Size:—

Major diam. 0.54, minor diam. 0.40, alt. axis 0.40 inch.

„ „ 18.0 „ „ 15.3 „ „ 16.6 millims.

[“On plain near Gollonsir village, very common.” (I. B. B.) The greater number, however, are marked “very common, from the plain in vicinity of Kadhab.”]

This shell is very similar to the last, but only about half the size; and the difference in the position of the peristome with respect to the penultimate whorl is very marked and constant.

*OTOPOMA CONICUM*, n. sp. (Plate XXVIII. fig. 1.)

Shell conoid, closely umbilicated, solid; sculpture fine, regularly disposed spiral ribbing crossed by fine costulation, continued to well within the umbilical region; colour white; spire conic, sides rather flat, apex subacute; suture rather shallow; whorls 5, the last well rounded, slightly descending, aperture circular, suboblique; peristome very thin; columellar margin simple, not reflected. Operculum shelly, solid, paucispiral, of 3 whorls, smooth subcentral nucleus depressed, concave behind.

Size:—

Major diam. 0.24, minor diam. 0.20, alt. axis 0.32 inch.

„ „ 11.0 „ „ 10.0 „ „ 7.0 millims.

[“From the plain about Gollonsir village.” (I. B. B.)]

*OTOPOMA TURBINATUM*, n. sp. (Plate XXVIII. fig. 2.)

Shell turbinate, umbilicated; sculpture regular, fine, equally distributed, spiral ribbing smooth on the last whorl near umbilicus; apex smooth; colour white; spire pyramidal, suture impressed; whorls  $4\frac{1}{2}$ , well rounded; aperture nearly circular, slightly angular above; peristome thin, much curved on the columellar margin. Operculum not obtained.

Size:—

Major diam. 8.8, minor diam., 7.9, alt. axis 5.0 millims.

„ „ 0.35 „ „ 0.33 „ „ 0.23 inch.

[“On stems of *Dracæna cinnabari*, Balf. fil., at 2000 feet elevation, on limestone.” (I. B. B.).] Only three specimens were obtained.

*TROPIDOPHORA SOCOTRANA*, n. sp. (Plate XXVIII. fig. 3.)

Shell trochiform, umbilicated, rather solid; sculpture three strong

longitudinal ribs on the periphery, with a fine intermediate one, and two above near the suture, crossed by strong lateral close ribbing or lines of growth; similar longitudinal sulcation on the base, smooth on the apex; colour white, ruddy within the aperture; spire pyramidal, sides flat; suture shallow; whorls  $5\frac{1}{2}$ , convex, the last slightly descending near the aperture; this is circular and oblique; peristome rather thin.

Operculum subtestaceous, paucispiral, rapidly increasing, nucleus subcentral (fig. 3*b*).

Size:—

Major diam. 10·0, minor diam. 9·2, alt. axis 6·4, total alt. 9·0 millims.

„ „ 0·39, „ „ 0·36, „ „ 0·25, „ „ 0·24, inch.

[“From stems of *Dracena cinnabari*, Balf. fl. . . . . on limestone, at an altitude of over 2000 ft.” (B. B.)] Fifteen specimens were found.

Two specimens are somewhat larger, and, being older, have flatter sides to the spire, and a blunter apex. They measure respectively:—

1. Major diam. 12·0, minor diam. 10·8.

„ „ 0·47, „ „ 0·43.

2. „ „ 11·0, „ „ 9·5, alt. axis 6·0 millims.

*TROPIDOPHORA BALFOURI*, n. sp. (Plate XXVIII. fig. 4.)

Shell elongately pyramidal, umbilicated, keeled, solid; first two apical whorls smooth, rest of shell ribbed spirally and on the base; seven ribs on each whorl, crossed by well-developed transverse ribbing; colour marbly white, ruddy brown or orange within; spire pyramidal acuminate, sides flat; suture shallow; whorls 6, sides convex, the last descending very slightly near the peristome; aperture broadly ovate; peristome rather thin, continuous.

Size:—

Major diam. 7·5, minor diam. 7·0, alt. axis 6·3, total height 8·7 millims.

[“On the limestone ridge to the S.W. of Gollonsir valley, only on the top of the ridge and facing the south.” (I. B. B.)]

*LITHIDION MARMOROSUM*, n. sp. (Plate XXVIII. fig. 6.)

Shell discoid, very solid, widely and openly umbilicated, sharply keeled; sculpture, strongly ribbed longitudinally with 5 sulcations below and 4 above the peripheral sulcation, crossed by very fine lateral regular striation; colour marbly white; spire flatly depressed, apex papillate, polished; suture shallow; whorls 5, eccentrically wound at the apex, the axis there not being perpendicular to the planes of the last whorl (figs. 6*b* and 6*c*); aperture circular, oblique; peristome reflected, strongly developed on the columellar margin.

Operculum shelly, concentric, of 3 whorls; the margin reflected, forming a raised spiral rib.

Size. Major diam. 10·7, minor diam. 9·2, alt. axis. 3·2 millims.

Animal pale ash-grey; tentacles black; foot divided longitudinally; proboscis long, bilobed.



["Very common everywhere on the ground." (I. B. B.)]

This species is nearest to *L. sulcatum*, Gray, or more correctly *Cyclotoma* (*Lithidion*) *lithidion*, Sowerby, Mr. Gray having adopted the specific name for his new genus; but this last shell is not so openly umbilicated. It is also very similar in form and coloration to *L. niveum*, Pfr., from Madagascar, but differs much in the aperture and sculpture, *L. niveum* being very smooth. *L. depressum*, Pfr. (the habitat of which is unknown), is also close; but the spire is quite flat. *L. souleyetianum*, Petit, from the island of Abd-el-Goury near Socotra, does not appear to be found in Socotra; it is much higher in the spire and altogether different in form. *L. desciscens*, Pfr. (from Mus. Cuming), is given as from Socotra, but is not in this collection. An examination of the species of *Lithidion* represented in the British Museum shows that the peculiarly irregularly wound apex is a generic character common to all.

#### CYCLOTOPSIS ORNATUS, n. sp. (Plate XXVIII. fig. 5.)

Shell openly umbilicated, depressedly conoid, thin; sculpture, spiral sulcation, every other rib being more strongly developed, crossed transversely by fine costulation; colour pale sienna with a pale ochre band on the periphery and with zigzag markings of the same colour on the second whorl, this coloration only seen well on young shells; spire somewhat low, apex smooth; whorls 4, well rounded, the last very slightly descending; aperture circular, oblique; peristome thin, scarcely reflected on the inner margin.

Operculum shelly, concentric, of 4 whorls; the margin well reflected outwards, its edge forming a continuous raised smooth spiral rib.

Size :—

Major diam. 8·2, minor diam. 6·8, alt. axis, 3·8 millim.

" " 33, " " 0·27, " " 14 inch.

["From under granite boulders, hills above Adona, over 2000 ft., and on stem of *Dracæna cinnabari*, Balf. fil., on limestones at same elevation." (I. B. B.)]

This is a most interesting form, connecting the fauna of these islands with India. It has a representative also in one species at the Seychelles.

#### EXPLANATION OF THE PLATES.

##### PLATE XXVII.

Fig. 1, 1 a. *Otopoma naticoides*, Récluz, nat. size, p. 252.

1 b. —, operculum of ditto.

2, 2 a. —, *balfouri*, n. sp., p. 253.

3, 3 a. —, *complanatum*, n. sp., p. 254.

4, 4 a. —, *clathratulum*, Récluz, var. *socotrana*, p. 254.

##### PLATE XXVIII.

Fig. 1, 1 a. *Otopoma conicum*, n. sp., p. 255.

1 b. Operculum of same.

Fig. 2. *Otopoma turbinatum*, n. sp., p. 255.

3, 3 a. *Tropidophora socotrana*, n. sp., p. 255.

3 b. Operculum of same.

4. *Tropidophora balfouri*, n. sp., p. 256.

5. *Cyclotopsis ornatus*, n. sp., p. 257.

5 a. Operculum of ditto.

6, 6 a. *Lithidion marmorosum*, n. sp., p. 256.

6 b, 6 c. Apex of ditto, much enlarged.

February 15, 1881.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of January 1881 :—

The total number of registered additions to the Society's Menagerie during the month of January was 46, of which 30 were by presentation, 1 by birth, 12 by purchase, and 3 were received on deposit. The total number of departures during the same period, by death and removals, was 163.

The most remarkable additions during the month of January were as follows :—

1. A White-nosed Saki (*Pithecia albinasa*), purchased January 11th, and apparently likely to do well. So far as I can make out, the typical example of this species in the Paris Museum has hitherto remained unique in Europe; so that we are fortunate in obtaining an example of so rare a species.

The animal, of which I exhibit a sketch by Mr. Smit (Pl. XXIX.), is uniformly, but rather sparingly, covered with black hairs. The nose is broadly naked and of a bright fleshy red, but shows a few white hairs between the nostrils, which are sufficient to justify its scientific name. The long hairs on the head fall on both sides of the head and over the front. The length of the body is about 15 inches, of the tail 18 inches. The latter organ, although clothed with elongated hairs, appears to be slightly prehensile. The specimen is of the female sex, apparently not fully adult.

The following references belong to this species :—

*PITHECIA ALBINASA.* (Plate XXIX.)

*Pithecia albinasa*, Is. Geoffroy Saint-Hilaire et Deville, Compt. Rend. xxvii. p. 498 (1848); Geoffroy St.-Hilaire, Arch. du Mus. t. v. p. 559; Gervais, Expéd. de Castlenau, Mamm. p. 16, t. ii. fig. 2.

*Chiropotes albinasa*, Gray, Cat. of Monkeys in B. M. p. 61 (1870).

2. An American Monkey of the genus *Callithrix*, probably referable to *C. brunnea*, Wagner (ex Natt. MS.), but not very easily determinable while alive. This specimen was purchased along with

the preceding and a Douroucoulí (*Nyctipithecus trivirgatus?*), all three probably from some district of the Upper Amazons.

This is the first example of any species of the genus *Callithrix* which we have yet received alive.

3. An example of a mammal of the genus *Tupaia*, obtained by purchase 11th January. The only form of this peculiar genus of Insectivora yet received was an example of *Tupaia peguana*, received in 1875 (see P. Z. S. 1875, p. 156.)

Mr. Selater exhibited examples of the eggs of:—

#### 1. OPISTHOCOMUS CRISTATUS.

Six specimens, belonging to Canon Tristram's collection, which had been obtained by a correspondent of Herr Nehrkorn of Riddags-hausen, Brunswick, at Obidos on the Amazons.

These eggs agreed in form and colour with the description of the egg of this singular bird given by Des Murs in his 'Oologie Ornithologique' (p. 108), and were certainly essentially Ralline in general characters.

#### 2. COTURNIX DELEGORGII.

A very beautifully marked egg, supposed to belong to this bird, had been sent for exhibition by Dr. Hartlaub. It had been obtained by Dr. Emin Bey, at Elemá, in Equatorial Africa, where the species is said to be very common on the western shores of Lake Albert Nyanza (*cf.* Petermann, Mitth. 1881, p. 8).

Mr. Howard Saunders exhibited, on behalf of Capt. E. A. Butler, Her Majesty's 83rd Regiment, some eggs of *Dromas ardeola* obtained on an island near Bushire, Persian Gulf. Mr. Saunders observed that this aberrant bird, which had generally been placed amongst the Plovers, laid pure white eggs placed in deep burrows in the sandy soil. (*Cf.* 'Stray Feathers,' 1879, pp. 381-384.)

The Rev. O. P. Cambridge, C.M.Z.S., exhibited and made remarks on a Hymenopterous parasite met with on certain Spiders in Dorsetshire, *Linyphia obscura*, Blackw. (♀), and *Linyphia zebrina*, Menge (♂). The larvæ were apodous and adhered to the abdomen of the Spider, and when full-grown were as large as the whole abdomen. The Spiders, although so burdened, seemed to lose none of their usual activity. The larvæ had changed to the pupa state about three days after their capture, and, in ten days or so more, to the perfect insect.

Dr. Capron, of Shere, near Guildford, has determined the parasite to be *Acrodactyla degener*, Haliday (Ann. N. H. ser. 1. vol. ii. p. 117 (1839)).

Very similar larvæ have been observed on the abdomen of *The-*

*ridion simile*, C. L. Koch, and several other small Spiders of the same or nearly allied genera.

It was very possible that there might be more than one species of parasite among the larvæ, and an interesting point thus remained to be worked out by students of Hymenopterous parasites.

Mr. E. W. H. Holdsworth, F.Z.S., exhibited a specimen of White's Thrush, *Turdus varius*, Pall., which had been killed near Ashburton, Devon, during the severe cold weather in January last. This bird was one of a flock of four or five of apparently the same species, and was stated to be the ninth recorded example of this eastern Thrush obtained in England since 1828.

The following papers were read:—

1. On the Coleopterous Insects belonging to the family *Hispidæ* collected by Mr. Buckley in Ecuador. By CHAS. O. WATERHOUSE. (Communicated by Dr. A. GÜNTHER, F.R.S., F.Z.S., &c.)

[Received January 27, 1881.]

(Plate XXX.)

The object of the present paper is to give an account of the *Hispidæ* collected by Mr. Buckley in Ecuador. The number of species hitherto recorded as inhabiting that country is only seventeen; of these Mr. Buckley found fifteen, as well as nineteen new species, making a total of thirty-six species.

The following are the descriptions of the new species, which appear to have all been collected at Sarayacu, with the exception of *Cephalolia læta*, which is from the Balzar Mountains, and *Cephalodonta lycoides*, which is from Chiguinda.

All the specimens are in the British Museum, the fine series collected by Mr. Buckley having been presented to the Trustees by Messrs. Godman & Salvin.

The two species to which an asterisk is prefixed were not met with by Mr. Buckley.

1. *PROSOPODONTA SCUTELLARIS*, n. sp. (Plate XXX. fig. 19.)

*P. nigra*, *opaca*; *thorace ante medium oblique angustato, sat crebre punctato, elytris ferrugineis, fortiter punctato-striatis, interstitiis secundo quartoque paulo elevatis nitidis*. Long. 6 lin.

Head dull, smooth, with a small frontal fovea. Thorax one fifth broader than long, dull, convex, impressed at the base before the scutellum, subparallel at the sides till near the front, where it is then arcuately narrowed to the head; very strongly and irregularly punctured, the punctures rather close at the base, more separated ante-

riorly. Scutellum shining, pitchy. Elytra dull brick-red, very convex; each elytron with ten lines of very strong, rather close punctures, besides the short scutellar line; the second interstice rather broader than the others, distinctly raised and shining; the fourth costa is also raised, but in a much less degree.

This species is most nearly allied to *P. costata*, Waterh. (Cist. Ent. ii. 1879, p. 428), but is more opaque and has the second and fourth interstices only of the elytra raised.

\*2. *DEMOTISPA ELEGANS*, Baly, Ent. Mo. Mag. 1875, xii. p. 75.

*Hab.* Ecuador.

Mr. Buckley did not meet with this species.

3. *CEPHALOLIA PRINCEPS*, Baly, Cat. Brit. Mus. p. 45.

4. *CEPHALOLIA CORALLINA*, Erichs., Wiegman. Arch. 1847, i. p. 151.

5. *CEPHALOLIA AFFINIS*, Baly, Cat. Brit. Mus. p. 44.

6. *CEPHALOLIA FLAVIPENNIS*, Baly, Trans. Ent. Soc. 1869, p. 373.

7. *CEPHALOLIA DEGANDEI*, Baly, Cat. Brit. Mus. p. 57.

8. *CEPHALOLIA ALTERNANS*, n. sp. (Plate XXX. fig. 5.)

*C. elongata, nitida, flava; fronte, thorace macula antica, elytrisque fasciis duabus latis nigris.* Long. 4 lin.

This species is very close to *C. degandei*, Baly, but is altogether a little more elongate and of a much deeper yellow. The antennæ are a little longer; the 5th and 6th joints are evidently longer than those in *C. degandei*; deep yellow, with the five apical joints very pale yellow.

The thorax has a black trapezoidal spot in the middle of the front margin; the middle is smooth; but towards the sides are some rather strong punctures, which are placed not very close together.

9. *CEPHALOLIA PULCHELLA*, Baly, Cat. Brit. Mus. p. 56.

The type specimen of this species from Nauta has the black on the thorax confined to the middle of the anterior margin, whilst the specimens obtained by Mr. Buckley have the thorax black, with the hind margin only yellow. In other respects the specimens do not differ materially.

10. *CEPHALOLIA ORNATA*, n. sp. (Plate XXX. fig. 6.)

*C. nigra, nitida; thorace angustissime flavo-marginato, elytris flavis, macula laterali apiceque nigris.* Long.  $2\frac{1}{2}$  lin.

Thorax rather narrower than the elytra, and about a quarter broader than long, very gently convex, parallel at the sides; moderately thickly and somewhat strongly punctured at the sides, smooth on the disk; the anterior angles gently rounded off and obtuse; the lateral margins narrowly reflexed; the posterior angles a little less

than right angles. Elytra moderately long, parallel, very distinctly striate-punctate, slightly impressed at the sides below the shoulders; the suture near the base is dusky; the apical fifth is black; and there is a small elongate black spot on the side rather before the middle.

11. *CEPHALOLIA GRAYI*, Baly, Cat. Brit. Mus. p. 51.

12. *CEPHALOLIA LATICOLLIS*, Baly, Trans. Ent. Soc. 1869, p. 368.

13. *CEPHALOLIA LÆTA*, n. sp. (Plate XXX. fig. 9.)

*C. elongata, angusta, ochracea, nitida; antennis, thoracis linea mediana, scutello, elytrorumque margine et apice nigris.* Long.  $3\frac{1}{2}$  lin.

Antennæ rather short, the third joint scarcely longer than the second. Head with a well-marked fovea on the vertex, continued anteriorly by a fine channel. Thorax convex, sloping down at the sides, a little broader than long, nearly parallel posteriorly, very slightly narrowed in front, smooth on the disk, with a few distinct punctures at the sides; the anterior angles obtuse and not at all prominent; the sides very finely margined; the posterior angles right angles; the base broadly lobed in the middle. Elytra not much broader than the thorax, parallel, convex, the lines of punctures well marked; the apical quarter and the lateral margin black; the black on the margin extends a little on the shoulder, and about the middle has a quadrangular projection, which extends to about the third dorsal stria.

*Variety.* With the median black stripe of the thorax almost wanting.

*Hab.* Balzar Mountains.

This species somewhat resembles *C. succincta*, Guérin, but has the thorax narrower in front and more convex, &c.

14. *CEPHALOLIA ANTENNATA*, n. sp. (Plate XXX. fig. 7.)

*C. rufo-ochracea; antennarum basi, thoracis linea mediana, elytrorum sutura apiceque nigris, corpore subtus plus minusve nigro.* Long. 3 lin.

Antennæ moderately long, the third joint nearly twice as long as the second; black, with the four apical joints yellow. Head with a brown band on the vertex; eyes large and prominent. Thorax very little wider than the head including the eyes, very little broader than long, convex, parallel, closely and very strongly punctured, the surface uneven, with a slight oblique impression on each side of the disk behind; anterior angles not at all prominent, obtuse; the sides straight, finely margined. Scutellum blackish. Elytra nearly twice as broad as the thorax, a little wider near the apex than at the base, with a distinct impression in the middle of the base of each; the lateral margins distinctly reflexed; very strongly and closely punctate-striate, the interstices very narrow and convex; deep reddish yellow, the suture and the apex broadly black, the shoulders dusky.

The head, the middle of the sterna and the middle of the base of the abdomen are reddish yellow. The legs are yellow, with the base of the tibiæ dusky.

15. *CEPHALOLIA FELIX*, n. sp. (Plate XXX. fig. 8.)

*C. elongata, angusta, flavo-rufa, nitida; antennis nigris, apice flavis, elytris sutura apicem versus marginibusque nigris, corpore subtus pedibusque rufo-flavis.*

Long.  $2\frac{3}{4}$  lin.

Antennæ moderately long, the three apical joints yellow; the third joint nearly twice as long as the second. Head with a small impression on the vertex. Thorax a very little wider than the head, a little broader than long, parallel, convex, with an impression on each side of the basal median lobe, not very closely but strongly punctured, with a narrow smooth median line; the front margin moderately arched; the anterior angles obtuse, and not so far advanced as the front margin; the sides straight, finely margined; the posterior angles a trifle greater than right angles; the basal lobe rather broad, and somewhat straight near the scutellum. Elytra nearly twice as broad as the thorax, elongate, a little broader before the apex than at the base, slightly impressed in the middle of the base, strongly punctate-striate, the striæ near the base only indicated by a few punctures, the interstices narrow and rather elevated; the margins (commencing below the shoulders) and the suture for half its length are black.

This species is closely allied to the preceding, both being of nearly the same form, agreeing in having the apex of the antennæ pale. They appear to be most nearly allied to *C. javeti*, Baly, but are still very distinct.

16. *CEPHALOLIA ANGUSTICOLLIS*, n. sp. (Plate XXX. fig. 4.)

*C. nigra nitida; thorace vix marginato, parce punctato.*

Long.  $2\frac{3}{4}$  lin.

Head narrow, with a fine median frontal ridge, which terminates between the antennæ in a minute, acute point; the internal margin of the eye is acutely raised. Thorax much narrower than the elytra, very little broader than long, convex, parallel, moderately strongly and somewhat sparingly punctured; the sides and anterior border extremely finely margined; the base only margined in the middle; the anterior angles rounded, the posterior slightly acute. Scutellum smooth, a little narrower at the base than across the middle, not very acute at the apex. Elytra subparallel, not much narrowed towards the apex, with lines of distinct punctures; there is a strongly impressed sutural stria, which, however, does not extend to the base of the elytra; the apex is very obtuse; on the lateral margin, a little below the shoulder, there is a distinct but shallow elongate impression.

This species is certainly congeneric with *Cephalolia angustata*, Guérin, but differs specifically from it in being of a rather broader form, &c. Both these insects resemble the species of the genus

*Stenispa*, but differ from them and from the species of *Cephalolia* in having a small acute frontal tubercle, and in having a raised inner margin to the eyes.

17. *HOMALISPA CRIBRIPENNIS*, n. sp. (Plate XXX. fig. 1.)

*H. nigra*; capite thoraceque flavis, elytris cyaneis, fortiter crebre punctatis.

Long. 3 lin.

Head obscure yellow, dusky about the eyes. Thorax at the base about two fifths broader than long, very obliquely narrowed anteriorly, impunctate, shining, convex on the disk, impressed at the sides; the anterior angles acute, but very slightly prominent; the sides very slightly arcuate, nearly straight; the posterior angles very acute; the base widely sinuate on each side. Scutellum black, smooth. Elytra deep blue, shining, moderately convex, a little broader than the thorax, subparallel, obtusely rounded at the apex; very strongly and closely punctured, the punctures near the sutures forming lines; the apical margins are very finely crenulate. Abdomen fulvous. The base of the anterior femora is yellow.

A second specimen has the abdomen and the anterior legs entirely black. The specimens are probably sexes.

This species may be placed near *H. javeti*, Baly; but the confused punctuation of the elytra separates it from all the species known to me.

18. *HOMALISPA COLLARIS*, n. sp. (Plate XXX. fig. 2.)

*H. nigra, nitida*; thorace pallide flavo, elytris striato-punctatis, vix cyaneo-tinctis.

Long  $3\frac{1}{2}$  lin.

Thorax about two fifths broader than long, slightly narrowed in front, gently convex on the disk, a little impressed within the posterior angles, shining and impunctate, pale yellow, with the anterior margin black in the middle; the base in the middle and the fine incrassated basal margin are also black; the anterior angles are very little prominent and are moderately obtuse; the sides are gently arcuate in front of the middle, straight (or only extremely gently sinuate) behind; the posterior angles slightly diverging and very acute. Scutellum smooth. Elytra distinctly broader than the thorax, elongate-oblong, moderately convex, a little narrowed at the base, parallel at the sides, obtusely rounded at the apex; black, with an obscure tint of dark blue, with lines of rather fine but distinct punctures, the interstices smooth; the punctuation obscure and irregular at the apex; the margins are impressed below the shoulders and a little reflexed; the apical margins finely crenulate. Under-side of the prothorax and the base of the anterior femora yellow.

19. *ALURNUS BATESII*, Baly, Ann. & Mag. N. H. 1864, vol. xiv. p. 334.

The specimens brought by Mr. Buckley differ from that described by Mr. Baly from Ega in having no black spot on the shoulder of the elytra.



20. *ALURNUS SAUNDERSII*, Baly, Cat. Brit. Mus. p. 28.

A specimen brought by Mr. Buckley appears to be referable to this species, but has a black spot on the shoulder, which is not mentioned in the description.

*Hab.* Ecuador.

21. *ALURNUS MUTABILIS*, n. sp. (Plate XXX. fig. 3.)

*Niger, subopacus, thoracis lateribus elytrisque pallide flavis, his plus minusve nigro ornatis.*

Long. 9–10 lin.

Thorax one quarter broader than long, moderately convex, very slightly narrower in front than behind, very gently arcuate at the sides; not very strongly, but rather thickly and irregularly punctured; yellow, with the disk and the extremely fine lateral margin black; there is a sudden constriction in front at the extreme anterior margin; and there is a small incision at each posterior angle. Scutellum smooth, impressed. Elytra dull, pale yellow, parallel at the sides, arcuately acuminate at the apex; very thickly but obscurely punctured; the extreme apical margin and the suture black, the black more or less dilating at the scutellum; the apex is rather acutely produced and is not emarginate. The black marks on the elytra vary: there appears always to be a black spot on the shoulder; this spot sometimes extends itself obliquely towards the suture, and sometimes expands so much as to unite with the black at the scutellum; there is also frequently a spot behind the middle of each elytron, sometimes forming a large black patch.

Most nearly allied to *A. lansbergi*, Sallé, but less elongate.

22. *ALURNUS CASSIDEUS*, Westw. Ann. Nat. Hist. 1841, viii. p. 204.

Two examples with entirely black elytra. Specimens brought by Mr. Buckley, in a former collection, have the elytra more or less rusty yellow, in which they agree more nearly with the original type. The type of this species is said to come from Mexico, and, according to a sketch in Prof. Westwood's possession, is much broader in the elytra than the specimens from Ecuador. As, however, there seems to be some doubt as to the correctness of the locality given for the type, and as the specimens from Ecuador vary somewhat in form, I think it best at present to consider them all one species.

23. *ARESCUS LABIATUS*, Perty, Del. Anim. p. 101, pl. 20. f. 7.

*Hab.* Sarayacu; Ega, Nauta, St. Paulo.

24. *ARESCUS PERPLEXUS*, Baly. (Plate XXX. fig. 14.)

This species differs from *A. labiatus* in having the antennæ black, with the basal joints pale beneath; the basal joint has the projection obliquely truncate, so that it is obtuse instead of being acute; the thorax is rather more deflexed at the anterior angles, and has a slight impression at the base before the scutellum. The interantennal process of the forehead is rather short and broad, truncate in the

female, and gently emarginate in the male. The head and thorax are sometimes yellow, sometimes black. The elytra are yellow or red, uniform or marked with black; with one or two spots at the base of each elytron, one a little before the middle (which frequently extends into a fascia), a spot rather behind the middle (which sometimes extends into a fascia or occupies the whole apical region).

Length  $5\frac{1}{2}$ –6 lines.

I have not been able to find where Mr. Baly described this species.

25. *ARESCUS PULCHER*, n. sp. (Plate XXX. figs. 11, 12.)

This species most nearly approaches *A. labiatus*, but differs in having the antennæ almost entirely black. The interantennal process of the forehead is broader and more obtuse. The elytra are yellow with deep violet or bluish spots and bands, instead of having the marking nearly black as in *A. labiatus*; and there are only two spots at the base of each elytron instead of three; the dorsal spot being more removed from the suture, is more in the middle of the base; and the humeral spot is more above the shoulder than at the side of the humeral callosity as in *A. labiatus*.

Length 7 lines.

Var. 1. Elytra yellow with two spots at the base.

Var. 2. Elytra with two spots at the base, with a broad fascia before and another behind the middle.

Var. 3. Like variety 2, but with the two basal spots confluent.

Var. 4. Head, sides of thorax, and legs reddish yellow; elytra with two spots at the base, a broad fascia before the middle, and a large oval spot in the apical area.

26. *ARESCUS ÆMULUS*, n. sp. (Plate XXX. fig. 13.)

*A. pallide flavus*; thorace antice sat angustato, ad latera sat punctato, elytris plaga magna cyanea.

Long.  $5\frac{3}{4}$  lin.

Most nearly allied to *A. perplexeus*, Baly, but differs in having the thorax much narrower, and distinctly narrowed anteriorly, less convex, and with the posterior angles more divergent; at the sides and the region of the posterior angles there are some rather strong punctures. The coloration would probably vary, as in the other species; but in the specimen which I am describing, the antennæ (except at the base beneath), the scutellum, the edge of the tibiæ, and the tarsi are black. The elytra are very pale yellow, with a large patch of dark blue behind the middle; but this patch is not of quite the same shape on the two elytra.

27. *ARESCUS HISTRIO*, Baly, Cat. Brit. Mus. p. 82, pl. vi. f. 8.

Mr. Buckley found this species in great abundance. It is the most variable Coleopterous insect at present known, and has this remarkable peculiarity, that the elytra have sometimes a longitudinal stripe and in some varieties transverse bands.

28. *UROPLATA RUGATA*, n. sp. (Plate XXX. fig. 15.)

*U. sordide flava, depressa; antennis nigris, apice ferrugineo, thorace lineis tribus nigrescentibus; elytris marginibus, strigis duabus obliquis fuscis apicali æneis, humeris triangulariter explanatis, apice truncato denticulato, dente externo acuto æneo.*

Long.  $3\frac{3}{4}$  lin.

Antennæ short, longitudinally carinate, the seventh joint with difficulty separable from the eighth. Thorax narrowed in front, very strongly and rather closely punctured; a median line and one on each side nearly black. Scutellum pitchy. Elytra with the shoulders triangularly expanded and raised; the apex denticulate, the outer angle produced into a strong tooth. Each elytron has two very strong shining costæ, besides a less marked sublateral one commencing under the shoulder and continued to and along the apical spine. The double rows of punctures in the interstices are very strong and close. There are the following dark bluish æneous markings—a line over the humeral angle, an interrupted oblique dorsal line before the middle, a similar one behind the middle, the lateral margin (except at the extreme base and apex), and the apical spine; there is a brown (æneous-tinted) line extending from one apical angle to the other, and a short line near the apex between the second and third costæ. The metasternum has a black line along its lateral margin.

This species is allied to *U. angulata*, Ol.

29. *UROPLATA DEPLANATA*, n. sp. (Plate XXX. fig. 16.)

*U. ferrugineo-flava; capite antennisque nigris; thorace linea laterali nigro-æneo tincta; elytris cyaneo-nigris, vitta lata communi haud ad apicem attingente ferrugineo-flava, ante medium et post medium dilatata, ad apicem truncatis, denticulatis, angulo externo obtuse producto.*

Long.  $3\frac{3}{4}$  lin.

The antennæ have the basal joints shining and sparingly punctured. The thorax is flattened, closely and strongly punctured, with a well-marked transverse impression on the disk behind the middle, and with a second smooth impression across the basal lobe. Each elytron has three shining costæ, the lateral one finer and less strong than the others; the double rows of punctures in the interstices are very strong and close; there is a little blue-black, this colour extending a little over the shoulder and about the middle; the sides are finely and acutely crenulate; the apex is broadly truncate, the external angle flattened and obtusely produced. The two apical segments of the abdomen are pitchy in the middle.

30. *UROPLATA BISPINOSA*, n. sp. (Plate XXX. fig. 17.)

*U. nigra; thorace lateribus ferrugineo-flavis; elytris ferrugineo-flavis, macula scutellari, linea brevi sub humero, apiceque nigris, hoc truncato, angulo externo in spinam acutam producto.*

Long.  $3\frac{1}{2}$  lin.

Thorax very convex, constricted before the anterior angles, which

are slightly prominent; the disk is very strongly punctured, but the punctures are not very numerous, although from their large size there is not much space between them; the sides are rusty yellow. The elytra are rusty yellow, with an oblong black spot common to both elytra at the scutellum, and the apical third is also black; each elytron has three strong costæ, the lateral one is rather less strong than the others, and at the apex turns away from the apical spine: the first and second interstices have two lines of strong punctures, a fine ridge dividing the lines at the apex; in the third interstice there are three lines of punctures at the apex; the sides are finely serrated; the external angle at the apex is produced into an acute spine, which is slightly concave at its base above. The middle of the sterna, and the intercostal process of the abdomen are pitchy-red; the legs are tinted with æneous; the femora have the base pitchy-red, the four posterior femora have a small acute spine near the apex below.

31. ODONTOTA ANNULIPES, n. sp. (Plate XXX. fig. 18.)

*O. nigra, opaca; fronte, thoracis lateribus, elytrisque ferrugineo-ochraceis, his sutura nigra, femoribus basi ferrugineo-annulatis.*

Long  $4\frac{1}{2}$  lin.

Antennæ moderately long and stout. Thorax a little impressed at the base, with a very fine raised line in the middle in front. Each elytron has four costæ; the two dorsal ones are very strong; the third is sharp over the shoulder, interrupted in the middle, and very fine at the apex; the fourth is entire but fine; the lines of punctures are strong and distinct; the suture and a small mark under the shoulder are black. The middle of the sterna and intercoxal process of the abdomen are pitchy yellow.

32. ODONTOTA? sp. inc.<sup>1</sup>

*O. nigra, opaca; elytris sanguineis, basi apiceque nigris, ad apicem obtuse rotundatis, breviter acute serratis.*

Long.  $3\frac{1}{2}$  lin.

A single example without antennæ, which I therefore indicate as a species without giving a name.

\* 33. ODONTOTA APICIPENNIS, Chapuis, An. Soc. Ent. Belg. 1877, xx. p. 18.

*Hab.* Ecuador.

This species is known to me only from description.

34. METAXYCERA QUADRIGUTTATA, n. sp. (Plate XXX. fig. 21.)

*M. sanguinea; elytris olivaceo-aneis, singulis maculis duabus sanguineis.* Long.  $4\frac{1}{2}$  lin.

Thorax velvety, shining on the disk in front, where there is a well-marked longitudinal impression. Scutellum pitchy. Elytra depressed on the back, finely crenulate at the sides, and more distinctly so at the apex; the disk of each elytron is dull and slightly velvety-black; the lines of punctures are very deep and distinct;

<sup>1</sup> The genus is doubtful, there being no antennæ.—C. W.

there are four costæ, the first and third are only distinct posteriorly, the second is very strong, shining, the fourth is finer and lateral; there is an ovate red spot just before the middle, and another some distance from the apex.

This species is most nearly allied to *M. amazona*, Baly; but that has three red spots on each elytron.

35. *CEPHALODONTA LYCOIDES*, n. sp. (Plate XXX. fig. 10.)

*C. nigra, opaca; thoracis lateribus ochraceis, flexuosis; elytris postice bene explanatis, ad apicem longitudini latitudine æquali, vitta obliqua humerali, fascia post medium suturaque ad apicem ochraceis.* Long. 7 lin.

Thorax slightly convex, rather rough above, trisinate at the sides, the anterior sinus the deepest, leaving the anterior angles projecting. Elytra at the base one third broader than the thorax, gradually widening to the apex, where their breadth equals their length; the sides rectilinear, the apex truncate and irregularly and obtusely dentate; each elytron has four costæ, the first is fine and indistinct, the second is well marked and shining, the third is only distinct over the shoulder, the fourth is fine and only distinct towards the apex; there are two lines of very strong transverse punctures in each interstice; on the lateral expanded part there are some strong transverse ridges, the apical portion strongly punctured. The underside of the head, the middle of the sterna, and the middle of the abdomen at its base and the lateral margins are yellow. The femora have a yellow spot at the base.

*Hab.* Chiquinda.

B.M.

Although this species has at first sight no resemblance to *Cephalodonta*, I find no characters of sufficient importance to induce me to separate it as a distinct genus. It has a strong resemblance to some species of *Lycidæ* of the genus *Calopteron*.

I think that *Alurnus cyaneus*, De Brême (Ann. Soc. Ent. Fr. 1844, p. 312), a species omitted from Gemminger and Von Harold's 'Catalogue of Coleoptera,' is better placed in *Cephalodonta* than in *Alurnus*, and is closely allied to the species I have just described.

36. *STETHISPA BONVOULOIRI*. (Plate XXX. fig. 20.)

*Stethispa bonvouloiri*, Baly, Ann. N. Hist. 1864, xiv. p. 266.

EXPLANATION OF PLATE XXX.

Fig. 1. *Homalispis cribripennis*, p. 264.

2. — *collaris*, p. 264.

3. *Alurnus mutabilis*, p. 265.

4. *Cephalolia angusticollis*, p. 263.

5. — *alternans*, p. 261.

6. — *ornata*, p. 261.

7. — *antennata*, p. 262.

8. — *felix*, p. 263.

9. — *lata*, p. 262.

10. *Cephalodonta lycoides*, p. 269.

11. *Arescus pulcher*, p. 266.

12. — *pulcher*, var., p. 266.

Fig. 13. *Arescus æmulus*, p. 266.

14. — *perplexus*, p. 265.

15. *Uroplata rugata*, p. 267.

16. — *deplanata*, p. 267.

17. — *bispinosa*, p. 267.

18. *Odontota annulipes*, p. 268.

19. *Prosopodonta scutellaris*,  
p. 260.

20. *Stethispa bonvouloiri*, p. 269.

21. *Metaxycera quadriguttata*,  
p. 268.

## 2. Additions to the Rhynchotal Fauna of the Ethiopian Region. By W. L. DISTANT.

[Received January 27, 1881.]

(Plate XXXI.)

The Rhynchota of the Ethiopian Region form a group of insects that has been fairly worked by entomologists, and of which sufficient material exists to warrant the hope that in a few years we may have a moderately complete list of the fauna. The late Prof. Stål attempted, and at the time succeeded in producing a Monograph, 'Hemiptera Africana,' which was complete to date, but now requires much supplemental work. I have for some years had considerable facilities in this direction, and have also lost no opportunity of acquiring African specimens. The following descriptions relate to undescribed species from collections which have come into my possession from various sources since I wrote my "Notes on African Hemiptera Heteroptera," in the 'Entomologist's Monthly Magazine,' vols. xiv. and xv. With the exception of two species from Nyassa and South-eastern Africa, they have all been received from the Calabar district, West Africa.

### HEMIPTERA HETEROPTERA.

#### Fam. PENTATOMIDÆ.

##### TROPICORYPHA FORMOSA, n. sp.

♀. Above bright green, shining; anterior two thirds of lateral pronotal margins, a small spot on each side of the head at base behind the eyes, ocelli, connexivum, underside of body, and basal halves of femora luteous. Antennæ pitchy, third joint much longer than second (fifth wanting). Head with the central lobe subprominent, lateral lobes rounded and somewhat reflexed at apical angles. Pronotum with the lateral margins straight, reflexed anteriorly. Lateral angles subprominent and subacute. Membrane pitchy, margins and apex paler. Rostrum reaching posterior coxæ, basal joint luteous, remainder pitchy. Tibiæ above strongly sulcate, tarsi pitchy. Ventral spiracles fuscous.

Long. 18 millims., lat. pronot. ang. 10.

*Hab.* Calabar.

This species is strikingly distinct from any other of the genus, both in size and colour. Bright green with luteous markings appear to be somewhat representative colours in the West-African Pentatomidæ.

*Note.*—In placing this species in the genus *Tropicorypha*, Mayr, and the following species in the genus *Halyomorpha*, Mayr, I rely more upon the diagnostic characters given by Stål (En. Hem. pt. v. pp. 56 & 57) than on those given in Dr. Mayr's original description (Verh. z.-b. Ges. Wien, xiv., pp. 910 & 911), which,

referring most exhaustively to the type species, are too minute if applied to the whole of the allied species of the genus, failing (especially in *Tropicorypha*) in the structural characters of the antennæ and rostrum.

*HALYOMORPHA VERSICOLOR*, n. sp. (Plate XXXI. fig. 1, ♀.)

Above pale luteous, irregularly punctured, and shaded with fuscous. Head luteous, with the lateral margins, posterior margins of central lobe (which are angulated and widened to base), and a small curved streak on inner margin of eyes black; obscurely transversely striate; lobes subequal in length. Antennæ, ♂, castaneous, third, fourth and fifth joints with the apices pitchy and subequal in length; ♀, second joint pitchy, third castaneous, pitchy at apex (remainder mutilated). Pronotum with the anterior portion pale levigate; posterior margin of this space very strongly sinuated, basal half clouded with fuscous and strongly punctate; the lateral margins are amplified and reflexed, with the anterior angles toothed behind the eyes, lateral angles subprominent and obtusely rounded. Scutellum with a small pitchy callosity in each basal angle, strongly punctate, with some obscure pitchy marks at base, lateral margins, and apex. Corium strongly punctate, clouded and mottled with dark fuscous, and with a small levigate space on disk near apex; membrane hyaline, with a short transverse pitchy line near base. Abdomen above red, connexivum ochraceous, with a black line at base and apex of each segment. Underside of body somewhat paler; legs irregularly marked with fuscous or pitchy. Rostrum just passing posterior coxæ, with the apex black.

Long., ♂, 13 millims., lat. pronot. ang. 7.

Long., ♀, 17 millim., lat. pronot. ang. 9.

*Hab.* Nyassa (*Farler*).

It is probable that the difference in size between the sexes is less than that observed between the only two specimens I possess or have seen. This very distinct species, in the structure of the pronotum, is most allied to *H. reflexa*, Sign.

*TYOMA PORRECTA*, n. sp. (Plate XXXI. fig. 2.)

Fuscous, sparingly but coarsely punctate; head more finely punctate. Antennæ ochraceous, with the second joint longer than the third, subequal with the fourth, fifth slightly the longest, and, excepting base, fuscous. Pronotum somewhat verrucose on anterior portion; lateral angles acutely straightened and produced; apices pitchy, with extreme tips reddish orange; lateral margins of pronotum and head obscurely black; margins of connexivum strongly and obtusely spinous. Body beneath much darker. Legs pale ochraceous; apices of femora, bases and apices of tibiae pale castaneous. Rostrum ochraceous, reaching posterior coxæ.

Long. 9 millims., lat. pronot. ang. 6.

*Hab.* Camaroons (*Rutherford*).

Allied to *T. cryptorhyncha*, Germ., the South-African and only other known species of this peculiar and distinct genus, from which

it differs in the direction of the pronotal angles, taking Herrich-Schäffer's figure as typical. This is the West-African representative of the genus, which, so far as we know at present, appears confined to Africa, and to comprise probably but two species.

*ASPAVIA GRANDIUSCULA*, n. sp. (Plate XXXI. fig. 3.)

Head with the apex of the central lobe somewhat prominent, pale ochraceous, with six longitudinal rows of coarse fuscous punctures. Pronotum with the lateral angles acutely produced, and with the apices slightly directed backwards, pale ochraceous, coarsely covered with dark punctures, the anterior and lateral margins and a transverse fascia across disk between humeral angles pale levigate, the last with a few scattered punctures; apices and fore borders of produced lateral angles black. Scutellum pale ochreous, coarsely and irregularly covered with dark punctures, a large oblong callosity in each basal angle and apex pale levigate. Corium pale ochraceous, disk and inner portion pale castaneous, coarsely and darkly punctate, and with a marginal (excepting base) row of coarse and dense black punctures; basal margin pale levigate. Membrane obscurely fuscous. Underside of body and legs ochraceous, head beneath and sternum sparingly, lateral pronotal angles very densely covered with black punctures. Abdomen with a central longitudinal castaneous fascia gradually narrowing to apex, between which and margin on each side is a black longitudinal fascia densely punctate. Rostrum reaching posterior coxæ, darkly and obscurely streaked, with the apex black. Antennæ with the second and third joints pale ochraceous, subequal in length, but shorter than the fourth and fifth, which are also subequal, but which (excepting base of fourth) are obscurely fuscous.

Long. 10 millims., lat. pronot. ang. 7.

*Hab.* Camaroons (*Rutherford*).

Allied to *A. brunnea*, Sign.; but, besides the larger size, the pronotal spines are less acute and not directed forwards, the second and third joints of the antennæ are subequal in length, the transverse fascia to the pronotum is also different.

Fam. COREIDÆ.

*AURIVILLIANA*, n. gen.

Body subdilated. Head subquadrate, cleft between the antenniferous tubercles. Rostrum moderately long. Pronotum with the lateral angles produced, the lateral margins strongly denticulated. Scutellum triangular. Abdomen moderately dilated. Anterior and posterior tibiæ dilated; intermediate tibiæ a little thickened before apex, or slightly subdilated. Apices of femora and inner margin of posterior tibiæ strongly denticulated. Abdominal spiracles transversely rounded, wider than long.

This genus differs from *Petillia*, to which it is closely allied, in the dilated anterior femora and the produced margin of the abdomen; from *Petascelisca* it is distinguished by the transverse abdominal spiracles, and the dilated and denticulated pronotum.



*AURIVILLIANA LURIDA*, n. sp. (Plate XXXI. figs. 6 ♂, 7 ♀.)

Ochraceous, speckled and streaked with fuscous. Antennæ pilose, black with the apical joint bright luteous in the male, pale luteous with the apex black in the female; first and second joints subequal, or second rather longer than first, third shortest, fourth the same length as second. Pronotum transversely striated with fuscous, lateral margins strongly denticulated, lateral angles produced, with a strong tooth at apex, and moderately denticulated behind. Scutellum narrowly black at base, with a central luteous spot. Corium finely speckled with fuscous, and a larger spot of the same colour on disk. Underside of body and legs concolorous. Rostrum about reaching posterior coxæ; second and fourth joints subequal in length, third shortest.

♂. Beneath with a luteous spot on each side at base of sixth segment; apical segment and anal appendages gibbous.

Long. 20 millims., abdominal expans. 9.

♀. Much broader than ♂; apical segment and anal appendages slightly raised and convex.

Long. 23 millims., abdominal expans. 11.

*Hab.* Natal, Delagoa Bay.

*PETASCELISCA*, n. gen.

Body oblong. Head subquadrate, and not emarginate between the antenniferous tubercles. Rostrum not reaching intermediate coxæ. Scutellum triangular, obtusely elevated at base. Apical margin of the corium sinuated. Posterior coxæ widely separated; intervening space double that between intermediate coxæ; anterior coxæ placed somewhat closely together. Anterior and intermediate femora obtusely noduled, and furnished beneath with two spines near apex; posterior femora much thickened, dilated, flattened, sinuated, and spined beneath. Anterior tibiæ moderately dilated on both sides; posterior tibiæ much more strongly so, above sinuated and prominently rounded about midway, whence to apex they are suddenly narrowed; beneath as above, but exhibiting a strong tooth in place of, and a little before, the rounded elevation above. Intermediate tibiæ simple. Abdominal margins much produced, strongly sinuated and angulated towards apex. Antennæ with the first three joints incrassated towards apex, fourth cylindrical. Abdominal spiracles rounded.

This genus comes naturally between *Petillia* and *Petascelis*. From the first it is separated by the rounded and not widely transverse abdominal spiracles, and from the second by the non-dilatation of the intermediate tibiæ. From both, also, *Petascelisca* is distinguished by the non-emargination between the antenniferous tubercles of the head.

*PETASCELISCA VELUTINA*, n. sp. (Plate XXXI. figs. 8 & 8a, b, ♂, 9 ♀.)

Above rich chocolate-brown, sparingly clothed with bright yellow

pubescence. Antennæ pilose; first three joints dark brown, of which the basal is thickly clothed with yellow pubescence; fourth joint pale brown, with apical third luteous, and extreme tip and base pitchy; first joint much longer than second, third shortest, first and fourth subequal. Head thickly pubescent at base. Pronotum with a pale central longitudinal pubescent line, on each side of which are two dark fasciæ, which, commencing at base, are slightly curved, and extend upwards through two thirds the pronotal length, when they are deflexed and again directed inwardly, both meeting on the central line, at about three-fourths the length from base; on outer side of these fasciæ at base are two others of the same colour, waved and directed inwardly, but little more than half the length of the central. Scutellum with the apex luteous. Corium with a large rounded dark spot on disk. Membrane cupreous; basal third and transverse waved central fascia dark chocolate-brown. Connexivum pitchy, with four bright luteous spots on each side. Underside and legs somewhat thickly pubescent. Abdomen above red, with the apex pitchy.

♂. Posterior femora very thickly incrassated; margins of abdomen strongly produced and angulated; third abdominal segment beneath occupied by a large raised tubercle, rounded behind, the margins of which are strongly granulate.

Long. 26-27 millims., lat. 8.

♀. Posterior femora much less strongly incrassated; margins of abdomen somewhat less produced and angulated; second and third abdominal segments beneath prominently gibbous.

Long. 25-27 millims., lat. 8.

*Hab.* Isubu, Calabar.

*PETASCELISCA FOLIACEIPES*, n. sp. (Plate XXXI. figs. 10, 10 a, b, ♂, 11 ♀.)

Pitchy-brown, sparingly clothed with fine yellow pubescence. Antennæ pilose, first joint longer than second, third shortest, fourth and first subequal. Pronotum with the lateral margins denticulated; the lateral angles flattened and moderately produced. Abdomen above red; third, fourth, and fifth segments broadly pitchy; connexivum black, with a spot near base of sixth segment obscure luteous. Tibiæ strongly dilated; posterior tibiæ strongly sinuated and toothed internally.

♂. Posterior femora thickly incrassated; second abdominal segment beneath gibbous and provided with a small narrow deeply sinuated tubercle; a small raised triangular tubercle on apex of sixth abdominal segment. Abdomen beneath concolorous.

Long. 29 millims., lat. pronot. ang. 11.

♀. Posterior femora much less incrassated; abdomen beneath unarmed; disks of sternum and first four segments dull luteous.

Long. 29 millims., lat. pronot. ang. 11.

*Hab.* Mongo-ma-Lobah, Calabar district.

Closely allied to *P. laminipes*, Fairm., but differs in the much more dilated and rounded anterior tibiæ, in the rounded dilatation of the in-

intermediate tibiæ, which is not posteriorly truncated as in *P. laminipes*, and also in the dilatation of the posterior tibiæ, which is outwardly rounded and not sinuated near the apex. The colour is also darker, and the abdominal margin much more widely produced.

Fam. PYRRHOCORIDÆ.

*ROSCIUS CIRCUMDATUS*, n. sp. (Plate XXXI. fig. 4.)

Black, apical portion of head, eyes, anterior, lateral, and posterior margins of pronotum, and basal margin of corium ochraceous or testaceous, and two transverse fasciæ of the same colour on corium, the first commencing at end of ochraceous basal margin and extending nearly to claval apex, the second extending transversely across near apex, and narrowly continued along inner margin to near claval apex, the two fasciæ thus almost enclosing a sublunate space. Body beneath black, posterior margins of prosternum, mesosternum, and metasternum, and three large spots on each side at coxæ luteous or creamy-white; abdomen with the first three segments and apical margins of the fourth, fifth, and sixth segments more or less luteous or testaceous. Legs black, trochanters reddish. Rostrum reaching fourth abdominal segment. Antennæ black; first, second, and fourth joints subequal in length, third shortest.

Long. 19 millims.

*Hab.* Isubu, Calabar.

This species is allied to *R. quadriplagiatus*, Schaum, but differs in the much more obscure and less deeply incised transverse incision to the pronotum; the body is also broader, of a different colour beneath, and with the marking of the corium distinct.

This would appear to be the *R. quadriplagiatus*, var. ?, Walk. (Cat. Het. v. p. 173. 3), from Congo. Walker, it is allowed by all who follow him, had no reticence in describing species; and the only reason for his not doing so in the present case appears to be, that, at the time of his writing, he had not seen Schaum's species, which is likewise confined to East Africa.

*DYSDERCUS ANTENNATUS*, n. sp. (Plate XXXI. fig. 5.)

Head sanguineous. Antennæ black, apical joint with basal half creamy-white, base of first joint spotted with sanguineous; first joint a little longer than the second, third shortest. Pronotum pale luteous, anterior portion black, posterior with a transverse central black fascia, lateral margin sanguineous, anterior margin pale luteous. Scutellum black. Corium ochraceous, thickly, finely, and darkly punctate, with a broad black claval fascia, and outer margin creamy white. Membrane black, with the basal angle obscure ochraceous, and the apical margins creamy white.

Head beneath sanguineous; sternum black, anterior margin of prosternum, posterior margins of prosternum, mesosternum, and metasternum, and a large spot near coxæ levigate creamy white, lateral margins of prosternum sanguineous. Abdomen creamy white; with the transverse margins of the first four segments and the whole

of the fifth black, the last with a narrow pale posterior margin; sixth segment and anal appendage sanguineous. Legs black. Rostrum about reaching posterior margin of second abdominal segment, black, with the apex somewhat paler.

Long. 12 millims.

*Hab.* Calabar.

Allied to *D. superstitiosus*, but differs in the colour of the antennæ, absence of black fascia to corium, &c.

#### EXPLANATION OF PLATE XXXI.

- Fig. 1. *Halyomorpha versicolor* ♀, p. 271.  
 2. *Tyoma porrecta*, p. 271.  
 3. *Aspavia grandiuscula*, p. 272.  
 4. *Roscius circumdatus*, p. 275.  
 5. *Dysdercus antennatus*, p. 275.  
 6. *Aurivilliana lurida* ♂, p. 273.  
 7. ——— ♀, p. 273.  
 8, 8 a, b. *Petascelisca velutina* ♂, p. 273.  
 9. ——— ♀, p. 273.  
 10, 10 a, b. *Petascelisca foliaceipes* ♂, p. 274.  
 11. ——— ♀, p. 274.

### 3. On a Collection of Shells from Lakes Tanganyika and Nyassa and other Localities in East Africa. By EDGAR A. SMITH.

[Received January 28, 1881.]

(Plates XXXII.—XXXIV.)

The collection of shells about to be described has been derived from three sources. Part of it was collected by the Rev. Edward Coode Hore; of Ujiji, and presented to the British Museum by his brother John Coode Hore, to whose liberality that institution owes the possession of the valuable collection which I had the pleasure of reporting upon in these 'Proceedings' last year. The second set, partly collected by Mr. Hore and in part by Dr. John Kirk of Zanzibar, was kindly consigned to the Museum by the latter. The third, and by far the largest, series was collected by Mr. Joseph Thomson, who has recently returned from an exploring expedition in Central Africa despatched by the Royal Geographical Society, whose council has placed the specimens in the national collection.

Among the species from Tanganyika are seventeen new to its fauna, of which eleven are undescribed. To three of these attaches the greatest interest; for they have all the appearance of being modified marine types. And such in all probability is the case; for Mr. Thomson informs me that in his opinion, judging from the geology of the neighbourhood, Tanganyika at some remote epoch has been an inland sea, the saltness of whose waters has almost entirely vanished, leaving only a peculiar taste which can scarcely be described as

brackish. The flavour is unpleasant ; and when other water is procurable, that of the lake is not drunk by the natives.

Two of these most remarkable shells (*Limnotrochus thomsoni* and *L. kirki*) possess all the general outward aspect of the marine genera *Trochus* and *Echinella* ; and the third has a wonderful resemblance to *Syrnola* in the Pyramidellidæ. Moreover *Melania nassa* (a very variable form) and *M. horei* (on the contrary, with very constant characters) have much more the look of marine than lacustrine species ; and it is very probable that when their animals are known they will exhibit some anatomical differences which will necessitate their removal from the Melaniidæ. In describing the remarkable genus *Tiphobia* in my former paper I was unable to give any account of the operculum. Fortunately one of the specimens brought home by Mr. Thomson contains that appendage ; and its structure shows that the species is Melanoid, as was originally surmised. The same defect in the description of the *Paludina*-like *Neothauma* is now supplied ; for several of the specimens contain opercula, which prove to be similar to that of *Paludina*.

Altogether thirty species are now known to inhabit Tanganyika. Of these seventeen are apparently peculiar to it, nine having been recorded from other localities, chiefly more northward, in Nilotic regions. Two of these (*Limnæa natalensis* and *Melania tuberculata*) also occur in Lake Nyassa ; and certain shells which appear to be varieties of *Corbicula radiata* and *Unio nyassaensis* also inhabit both lakes. Only two additional species are now included in the Nyassa fauna—one a new *Ampullaria* (a genus not previously recorded from that lake), the other the well-known *Lanistes purpureus*—thus raising the total number of its known species to twenty-seven.

Of the land-shells hereafter described I would call special attention to the *Bulimus notabilis*, quite unlike any other African form, and to *Streptaxis gigas* and *S. craveni*, the former being the giant of the genus.

#### 1. CYCLOPHORUS WAHLBERGI, Benson.

*Cyclophorus wahlbergi*, Pfeiffer, Con.-Cab. pl. 50. f. 17-19 ; Reeve, Con. Ic. f. 81.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*).

This well-known South-African form has not, I believe, been recorded from so northern a locality ; but two other species which are very similar have been described :—one, *C. magilensis*, Craven, from Magila, which I think may prove to be only the young state of this species ; and the other *C. hildebrandti*, Martens, from Ukamba, which, although in general aspect very like, still differs in its greater size and fewer whorls. In Reeve's figure the aperture is represented unusually large.

#### 2. CYCLOSTOMA INSULARE, Pfeiffer, var. (Plate XXXII. figs. 1, 1 a.)

*Cyclostoma insulare*, Pfeiffer, Proc. Zool. Soc. 1852, p. 64 ; Couchyl.-Cab. p. 351. no. 368, pl. 45. figs. 5, 6 ; Reeve, Con. Ic. fig. 41.

*C. kraussianum*, Reeve (non Pfr.), Con. Ic. fig. 52.

Var. = *C. lineatum*, Pfr. Con.-Cab. pl. 45. f. 3-4; Reeve, Con. Ic. f. 46?

*Hab.* Between Lake Nyassa and the east coast (*Thomson*).

The shells from the above locality differ in some respects from the typical form of this species, yet scarcely sufficiently and persistently to enable me to describe them as distinct. The main difference is that of form and in the size of the aperture. In the smallness of the latter, four of them correspond with what I believe is only a variety of this species, viz. *C. lineatum* of Pfeiffer. Two others are more depressed, and have the last whorl, umbilicus, and aperture unusually large. It may be as well to point out the fact (which as far as I know, has not been previously noticed) that the true *C. kraussianum* of Pfeiffer is a very distinct species from that which appears as such in the monograph by Reeve, who in its stead merely figures (pl. ix. fig. 52) a second example of the present species, which he correctly delineates on the previous plate (fig. 41). The shell represented by him (fig. 46) as *C. lineatum* is not the type described by Pfeiffer, which is accurately depicted by the latter author in the 'Conchylien-Cabinet.' I may also take this opportunity of pointing out that the *C. goudotianum* of Sowerby is a very distinct species from that figured by Pfeiffer (Conch.-Cab. pl. 13. figs. 8-10) under that name; also Reeve's figure (no. 42 *a*) correctly delineates the original type of the same species, but figure 42 *b* merely represents a smooth variety of the *C. insulare*. Although *C. goudotianum* is stated by the describer to have been collected in Natal by Dr. Krauss, I am of opinion that it will eventually prove to be a Madagascar species. In the expansion of the lip, its *tout ensemble*, and the presence of a colour band within the umbilicus (a feature not met with in species of this genus from South Africa, and which occurs in some from Madagascar and also in several species of *Helix* from that island) it calls to mind certain forms from the latter locality. The name (*insulare*) of this species is an unfortunate one; but until it is proved that it is without doubt distinct from the old *C. ligatum* it may be desirable to retain it.

### 3. *HELIX* (*NANINA*?) *NYASSANA*. (Plate XXXII. figs. 2-2 *b*.)

Shell narrowly umbilicated, thin, depressed, keeled, rather glossy brownish horn-colour; spire shortly conical. Whorls  $5\frac{1}{2}$ , moderately convex, impressed beneath the suture, and depressed or shallowly channelled at the lower part immediately above the suture. Sculpture consisting of distinct and somewhat prominent lines of growth, crossed with close concentric microscopic striæ; last whorl large, keeled and angled above the middle, convex beneath; keel not acute; groove just above it distinct but not deep. Aperture obliquely lunate. Peristome thin, only expanded slightly over the umbilicus. Greatest diameter 25 millims., smallest 21; height 13; aperture 10 long, 13 broad.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*).

The spiral sculpture which adorns this very interesting shell is

very beautiful, but only visible under a powerful lens. It is a larger species than *H. pyramidea* of Martens, has fewer whorls, and is more depressed and carinate. The depression immediately above the keel of the body-whorl and above the suture in the upper volutions is an interesting feature. The west-coast species, which is known under the three names *H. pellucida*, Gould, *H. troglodytes*, Morelet, and *H. africana*, Pfeiffer, is very like this species. It is, however, more coarsely sculptured, with a less flattened spire and a less angulated body-whorl, and lacks the depression above the angle and on the upper volutions.

4. *HELIX* (*TROCHONANINA*) *MOZAMBICENSIS*, Pfeiffer, var.? (Plate XXXII. figs. 3, 3 a.)

*Helix* (*Trochonanina*) *mozambicensis*, Pfeiffer, P. Z. S. 1855, pl. 31. f. 9; Novitates Conch. iii. pl. 108. f. 1-3; var., figs. 4-6.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*).

Only a single specimen was brought home by Mr. Thomson from the above district. It is distinguished from all the specimens of this species which I have seen by the much greater width of the umbilicus, its coarser arcuate lines of growth, somewhat greater solidity of texture, and small size. It appears to be adult; yet its greatest diameter is only 11 millims., and its height scarcely 6. These measurements, in comparison with those of the variety *albopicta* described by Martens, are very small; for some specimens of the latter form attain a width of 19 millims., with a height ranging from 10 to 13. Other localities for this species are near the Albert-Nyanza lake, Zanzibar, Panjan, Kitui in Ukamba, and Tette.

5. *HELIX* (*TROCHONANINA*) *JENYNSI*, Pfeiffer.

*Helix* (*Trochonanina*) *jenyinsi*, Pfeiffer, Reeve, Con. Ic. f. 979; Pfr. Con.-Cab. pl. 129. f. 23 & 24; Philippi, Abbild. ii. pl. 7. f. 8.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*).

This species has also been recorded from Zanzibar and Pangani.

The dimensions of the largest shell considerably exceed those of the originally described specimen. Its greatest diameter is 16 millims., and the height is  $10\frac{1}{2}$ .

6. *STREPTAXIS GIGAS*. (Plate XXXII. figs. 4, 4 a.)

*Streptaxis gigas*, E. A. Smith, Annals & Mag. Nat. Hist. ser. 5, vol. vi. p. 429 (1880).

Shell very large, white, widely umbilicated. Whorls 6, regularly increasing, rather convex, furnished with close, coarse, very arcuate costulae extending from suture to suture; the latter are transversely striated on one side only, namely that nearest the aperture. Body-whorl glossy beneath the periphery, exhibiting faint lines of growth. Aperture large, sublunate; lip oblique, arcuate and prominent above, and very widely sinuated beneath, thin. Columella somewhat expanded at the upper part. Height 30 millims., diam. 33; aperture  $17\frac{1}{2}$  long, 15 wide.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*).

The two specimens of this species are apparently both young, as the characteristic deviating body-whorl is not yet developed. The base is widely umbilicated, as in the Brazilian *S. candida*. When adult this must be the giant of the genus, and a most remarkable shell. The costulae are strong, remarkably flexuous beneath the suture, and then obliquely arcuate across the whorls; what I have described as striae upon the left side of them, or that last formed and nearest the aperture, is rather a kind of pitting.

7. *STREPTAXIS CRAVENI*. (Plate XXXII. figs. 5, 5 a.)

*Streptaxis craveni*, E. A. Smith, Annals, l. c.

Shell narrowly umbilicated, obliquely distorted, smooth, glossy, dirty milky-whitish. Whorls 7, slightly convex, closely costulately striated beneath the suture. Last whorl suddenly descending in front, then rising somewhat upon the preceding whorl, very obliquely deviating. Aperture oblique, edentulate; outer lip (viewed laterally) sinuated at the suture, then prominently arcuate and oblique beneath, a little thickened and reflexed. Columella and basal margin thickened and narrowly reflexed, the former a trifle arcuated. Length from apex to base of aperture 29 millims.; diameter of last whorl 22; aperture 15 high,  $12\frac{1}{2}$  broad.

*Hab.* On hills between the mouth of the river Dana and Mombasa, East Africa (*Kirk*).

This is one of the finest species of *Streptaxis* yet discovered, and remarkable on account of the peculiar outline of the labrum, the smoothness and polish of its surface, and its large size. I have much pleasure in naming it after my friend Mr. A. E. Craven, who has contributed to our knowledge of the shells of the East-African region, and has also written a very important monograph of the microscopic genus *Sinusigera*, and other valuable contributions to conchological science.

8. *STREPTAXIS MOZAMBICENSIS*. (Plate XXXII. figs. 6, 6 a.)

*Streptaxis mozambicensis*, E. A. Smith, Annals, l. c.

Shell small, linearly rimate, whitish, smooth, glossy. Whorls 6, convex, crenulated beneath the deep suture; last whorl oblique, of the same width as the preceding, descending in front, and briefly ascending at the aperture, a trifle flattened above the aperture; the latter circularly lunate, small, edentulate; outer lip a trifle arcuate viewed laterally, oblique, narrowly expanded. Columellar margin more broadly reflexed. Height  $7\frac{1}{2}$  millims., diameter of last whorl  $4\frac{1}{2}$ ; aperture 3 long,  $2\frac{1}{2}$  wide.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*).

This species is smaller and less distorted than *S. kirkii*, Dohrn, and has merely a linear umbilical fissure. It is likewise smaller than *S. enneoides*, Martens, not perforate, smooth, and has more convex whorls.



## 9. ENNEA OBESA, Gibbons.

*Buliminus obesa*, Gibbons, Taylor's Quarterly Journ. of Conchol. vol. i. p. 255, pl. 2. f. 3.

*Hab.* Near Lake Nyassa, and between it and Dar es Salaam (*Thomson*); "Bawri Island, Zanzibar" (*Gibbons*).

This species appears to be a dwarf form of *E. ovoidea* from the island of Mayotte. The texture is waxy white and semitransparent; the peritreme is opaque white; and the suture is linearly margined. The body-whorl is somewhat flattened just above the aperture, and it ascends chiefly near the lip. The largest specimen from Nyassa is  $28\frac{1}{2}$  millims. long and 13 broad.

## 10. ENNEA LÆVIGATA, Dohrn. (Plate XXXII. fig. 6\*.)

*Ennea lævigata*, Dohrn, Proc. Zool. Soc. 1865, p. 232; Pfeiffer, Monog. Helic. vol. v. p. 454.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*); on a small rocky island in Lake Nyassa (*Kirk*).

Like several other species of *Ennea* this also varies much in size. Those described by Dohrn were  $\frac{5}{16}$  inch long and  $\frac{1}{8}$  broad, whilst the specimens collected by Mr. Thomson have a length of  $\frac{7}{16}$  inch and a diameter of  $\frac{3}{16}$ .

## 11. BULIMUS (RHACHIS) BRAUNSI, Martens. (Plate XXXII. figs. 7-7 c.)

*Bulimus (Rhachis) braunsi*, Martens, Von der Decken's Reise in Ost-Afrika, p. 151; Nachrichtenblatt der deutsch. malak. Gesellschaft, vol. i. 1869, p. 150; Pfeiffer, Novitat. Conch. vol. iv. pl. 118. f. 11, 12.

Var. *hildebrandti*, Martens, Monatsberichte Akad. Wissensch. zu Berlin, 1878, p. 294, pl. 2. f. 1, 2.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*); Durum (*Hildebrandt*); Zanzibar (*Brauns*); Uzanamo (*Capt. Speke*).

The colouring of the specimens which appear to belong to this species is very variable. In one instance it is of a uniform pale straw tint, with the exception that at the apex it is nearly black and in the umbilical region transparent horny. Two other specimens present markings such as were described originally by Martens, except that the apices are blacker and the two dark zones (one round the middle of the last whorl, and the other below it) are interrupted more or less, and these, together with the series of spots, are nearly black. In another specimen the series of spots flow into one another, thus forming stripes, and those on the lower half of the body-whorl are also confluent; and again, in another example, the two rows of spots on the upper part of the last whorl are wanting.

The specimens described by Martens from Zanzibar are said to have had the appearance of young shells, and the last whorl obtusely angulated; and in the variety *hildebrandti* it is characterized as very obtusely angulated. In the shells before me, which are larger than those referred to by Martens, the angulation is totally absent.

This may result merely from difference of age. The largest specimens collected by Mr. Thomson is  $19\frac{1}{2}$  millims. long and  $9\frac{1}{2}$  broad.

12. *BULIMUS NOTABILIS*. (Plate XXXII. fig. 8.)

*Bulimus notabilis*, E. A. Smith, Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 427 (1880).

Shell elongate-ovate, deeply and widely umbilicated, of a uniform light brown colour. Whorls 8 in number, slowly enlarging, moderately convex, sculptured with very fine, close-set, slightly oblique and feebly flexuous liræ or raised lines of growth. Suture simple, almost horizontal. Last volution convex, exhibiting a very faint indication of a median angulation or almost obsolete carina. Aperture irregularly ovate, subauriform, rather acuminate both above and at the base, where it is channelled, pinkish or pinkish brown within. Umbilicus broad, pervious to the apex, surrounded by an obtuse ridge. Peristome whitish, not thickened; outer margin (viewed laterally) oblique, scarcely arcuate, a trifle prominent in the middle, not reflexed or expanded; columellar margin broadly expanded, arcuate, its upper extremity united to the superior termination of the outer lip by a thin callosity. Length 43 millims., diameter of last whorl 20; aperture  $17\frac{1}{2}$  long, 11 wide.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*).

The peculiarity of the basal canaliculation of the aperture affords an interesting intermediate grade between this genus and *Achatina*.

13. *BULIMUS (BULIMINUS) KIRKI*, Dohrn. (Plate XXXII. fig. 9.)

*Buliminus kirkii*, Dohrn, Proc. Zool. Soc. 1865, p. 232; Martens, Decken's Reisen in Ost-Afrika, vol. iii. p. 150.

*Hab.* Between Lake Nyassa and east coast (*Thomson*).

This species was originally collected by Dr. Kirk at Cabaceira in Mozambique, and subsequently by Mr. A. E. Craven at Magila.

14. *ACHATINA HAMILLEI*, Petit. (Plate XXXII. fig. 10.)

*A. hamillei*, Petit, Journ. de Conch. 1858, vol. vii. p. 384, pl. 13. f. 3.

Shell large, ovate, acuminate above; spire whitish, striped obliquely with brown; last whorl purplish, striped at intervals and covered with an olive epidermis. Sculpture granose, consisting of coarse oblique lines of growth, which are very coarse beneath the suture, crossed by spiral impressed lines. Whorls 8, moderately convex. Aperture inversely subauriform, a trifle longer than the spire, bluish white within. Peristome thin, margined within with purplish brown. Columella thickened, white, not very arcuate or contorted, somewhat abruptly truncated, united to the lip above by a thickish white callosity. Length 130 millims., diam. 62; aperture 69 long, 40 wide.

*Hab.* Usambara (*Dr. J. Kirk*); West Africa (*Petit*).

The spire of this shell is very like that of *A. petersi*, Martens. The latter, however, is a smaller species, if the dimensions given by

the author are those of an adult specimen; and the aperture is proportionally longer. In the present species the coloration is rather different, and the epidermis is of an olive tint instead of rich fulvous brown.

15. *ACHATINA CRAVENI*. (Plate XXXIII. fig. 11.)

*Achatina kirkii*, E. A. Smith, Ann. & Mag. Nat. Hist. 1880, vol. vi. p. 428.

Shell elongate ovate, somewhat acuminate above, beneath a yellowish epidermis white, ornamented with suberect, slightly wavy, brown stripes. Whorls 8-9, rather convex, rather coarsely granosely sculptured; suture between upper whorls horizontal, between two last more oblique; last whorl descending, smoother upon the lower part. Aperture subpyriform, bluish white, occupying less than half the shell. Columella not much arcuated, whitish, rather abruptly truncated, connected with the upper extremity of the outer lip by a thin callosity. Length 81 millims., diam. 37; aperture 39 long, 20 wide.

*Hab.* Between Zanzibar and Lake Tanganyika (*Kirk*).

The granose surface of this species is the result of the coarse raised lines of growth being crossed by transverse impressed striæ, which being somewhat remote from one another cause the granules to assume a rather elongate form. Mr. Alfred E. Craven informs me that the distinguished name of Dr. Kirk has already last year been associated with a species of this genus. Such being the case, I am compelled to alter the designation originally applied to this species; and therefore I have much pleasure in substituting that of *A. craveni*.

16. *ACHATINA THOMSONI*. (Plate XXXIII. fig. 12.)

*Achatina thomsoni*, E. A. Smith, Annals, loc. cit.

Shell moderately solid, elongate ovate, beneath a yellow epidermis whitish, striped with blackish brown. Spire sometimes purplish red or whitish, more or less worn, and in consequence, to a certain extent, lacking the striping; the latter is, as a rule, rather regular and only a little wavy. Whorls 7, a little convex, striated by the lines of growth, covered by a thin yellow epidermis, which is beautifully sculptured with most minute striæ in a crisscross fashion, producing the woven appearance of a fabric; last whorl elongate, narrow, gradually descending. Aperture pyriform, bluish white. Columella arcuate, thickened, not very abruptly truncated at the base, united to the lip by a thin callosity. Length 75 millims., diam. 32; aperture 38 long, 21 broad.

*Hab.* Between Lake Nyassa and east coast (*Thomson*).

This species is remarkable for its narrow ovate form and the peculiar woven appearance of its epidermis. The proportion of the length of the aperture to that of the entire shell varies; in some specimens it occupies rather more than half the total length, and in others somewhat less. The deep-brown or black stripes edged with brown, as a rule, occupy more of the surface than the yellow spaces

between, and, although somewhat wavy (upon the last whorl especially), do not take a large zigzag pattern. Most specimens are more or less streaked with opaque golden lines in the direction of the lines of increment, which when falling upon the dark stripes tell very vividly.

17. *ACHATINA (LIMICOLARIA) CAILLAUDI*, Pfeiffer. (Plate XXXIII. fig. 13.)

*Achatina (Limicolaria) caillaudi*, Pfeiffer, Zeitsch. f. Mal. 1850, p. 86; Mon. Hel. vol. iii. p. 386, vol. iv. p. 584, vol. vi. p. 208; Martens, Mal. Blät. 1865, vol. xii. p. 197.

*Hab.* Near Lake Tanganyika (Thomson).

This species varies greatly in breadth and length, as may be judged from the measurements given by Martens in the work above mentioned. One of the specimens from Tanganyika is remarkably slender, having a length of 71 millims. and a diameter of 20, the aperture being 21 long. The species has not hitherto been recorded from so southern a region.

18. *ACHATINA (LIMICOLARIA) RECTISTRIGATA*, Smith. (Plate XXXIII. figs. 14, 14 a.)

*Achatina (Limicolaria) rectistrigata*, Smith, Proc. Zool. Soc. 1880, p. 346, pl. xxxi. fig. 2.

*Hab.* Near Lake Tanganyika (Thomson).

Additional specimens show that this species varies considerably in form and the relative proportion of the whorls to one another; but the regularity of the striping is still maintained. Besides the lines of increment, some examples are ornamented with spiral striation upon the upper whorls, which produces a subgranose appearance. The following measurements will best demonstrate the variation of form:—

Length 39 millims., diam. 17, aperture 14 long.

„ 39 „ „ 16½, „ 15 „

„ 44 „ „ 17, „ 16 „

„ 41 „ „ 14, „ 14 „

The last measurements are of a specimen from near Ujiji, sent by Dr. Kirk to the British Museum, and received by him from Mr. Hore.

19. *SUBULINA LENTA*. (Plate XXXIII. fig. 15.)

*Subulina lenta*, Smith, Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 428 (1880).

Shell subulate, imperforate, very slowly enlarging, very elongate and narrow. Whorls — ? (probably 11 or 12), very slightly convex, covered with a thin, glossy, pale olivaceous epidermis, varied at intervals with darker oblique stripes. Suture simple, rather oblique and deepish. Sculpture consisting of fine oblique and feebly flexuous lines of increment, faintly puckered at the upper extremity. Aperture small, occupying less than one fifth of the entire

length. Columella very arcuate, abruptly truncated at the lower extremity. Probable length 41 millims., actual length of seven remaining whorls 36; diameter of last whorl  $7\frac{1}{2}$ , of penultimate 7, of antepenultimate  $6\frac{1}{3}$ ; aperture  $7\frac{1}{2}$  long, 4 broad.

*Hab.* Near Lake Tanganyika (*Thomson*).

The brevity of the aperture in proportion to the total length of the shell, its narrow elongate form, and the slow increase of the whorls constitute the chief characteristics of this species. *Spiraxis bistorta* of Pfeiffer has a considerable resemblance to it, but has more convex whorls, a longer aperture, and a different columella.

## 20. SUBULINA SOLIDIUSCULA. (Plate XXXIII. fig. 16.)

*Subulina solidiuscula*, Smith, Ann. & Mag. N. H. 1880, vi. p. 428.

Shell elongate, subulate, rather solid, imperforate, white, covered with a thin olivaceous epidermis, obliquely striated by the lines of growth, which are crossed by shallow spiral striæ, producing a somewhat granose or wrinkled surface. Lateral outlines rectilinear, slowly converging. Apex obtuse, truncated. Remaining whorls 8 in number, very slightly convex and slowly increasing, separated by a rather horizontal, simple, distinct suture. Aperture short, and the columella curved. Probable length of a perfect specimen 52 millims.; actual length of shell, consisting of eight volutions, 43 millims., diam. 11; aperture 9 long,  $5\frac{1}{2}$  broad.

*Hab.* Near Lake Tanganyika (*Thomson*).

Of this interesting species only a single specimen was obtained. It is comparatively solid for a shell of this genus, and also remarkable on account of the very elongate form and the exceptionally slow increase of the volutions. The apex of the shell is obtusely truncated, but this may be the result of an accident in this instance, and not a constant specific character. The spiral or transverse striæ are but feebly impressed, but crossing the fine lines of growth give them a crinkled appearance.

## LIMNOTROCHUS.

*Limnotrochus*, Smith, *ibid.* p. 425.

Shell trochoid, umbilicated, without an epidermis, spirally ridged. Body-whorl keeled round the middle. Aperture non-lirate within, with the outer lip oblique, the basal margin broadly sinuated, and the columella-edge somewhat reflexed and united to the labrum above by a callosity. Operculum horny, paucispiral, littorinoid.

This remarkable form has all the appearance of a *Trochus* when viewed with the aperture from the eye. It is, however, more closely related to the Littorinidæ, and exhibits the greatest affinity with the genus *Echinella*, from which, however, it may be distinguished by its operculum and the broad shallow sinuation in the lower margin of the aperture.

## 21. LIMNOTROCHUS THOMSONI. (Plate XXXIII. figs. 17-17b.)

*Limnotrochus thomsoni*, Smith, *loc. cit.*

Shell moderately solid, narrowly umbilicated, trochiform, livid

purplish dotted with brown, whitish at the suture and at the base. Spire acutely conical, with rectilinear outlines. Whorls 7, flat, sloping, with a broad deep furrow at the lower part, which is margined above by a keel, which on the upper volutions is simple, remarkably prominent and acute, and giving to them quite a pagoda-like appearance. On the last two and a half whorls it is less acute and minutely nodulous; and above that there are three other granulous ridges, whereof the uppermost, or that immediately beneath the suture, is conspicuously the largest; these gradually become finer and less granulous as they ascend the spire, so that upon the first few whorls they are simple thread-like liræ; the last whorls also exhibit fine liræ of a similar character between the larger granulous keels, and the entire surface is ornamented with very fine lines of growth. The body-whorl is sharply angulated and carinate at the middle; and the slightly convex base bears about eight principal concentric ridges with interlying finer thread-like ones. Aperture subquadrangular, within purplish at the upper part and whitish beneath, equalling about  $\frac{1}{2}$  of the entire length of the shell. Outer lip thin, obliquely receding, a little incurved above the carina, not thickened. Basal margin broadly sinuated, ex-curved, and slightly effuse. Columella thin, arcuate, a trifle reflexed at the umbilicus, and joined to the upper extremity of the labrum by a thin white callosity. Operculum horny brown, about 5-whorled, distinctly marked with arcuate lines of growth. Length 18 millims., diam. 11; aperture  $7\frac{1}{2}$  long, 6 broad.

*Hab.* Lake Tanganyika (Thomson).

I feel much pleasure in naming this species after Mr. Thomson, its discoverer. Among the several forms new to science contained in his collection this is perhaps the most remarkable. The colour of it is very difficult of description. The general tone of the spire is a sort of livid purplish tint, divided into zones by the whitish furrow which encircles the whorls immediately above the suture. The tubercles, too, upon the ridges also stand out in pale relief; and the interstices between them are frequently dotted with brown. The keel around the middle of the body-whorl is scarcely tuberculous, or at all events much less so than the carinæ above. The base is almost entirely white, with the exception of red dotting sometimes present upon some of the larger ridges, which exhibit hardly any indication of tubercles. The effuse broad situation in the base of the aperture is best seen when the base of the shell confronts the eye.

## 22. LIMNOTROCHUS KIRKI. (Plate XXXIII. figs. 18-18 b.)

*Limnotrochus kirkii*, Smith, Ann. & Mag. N. H. 1880, vi. p. 426.

Shell solid, trochoid, dirty whitish, deeply and narrowly umbilicated. Spire acutely conical. Whorls 6 or 7, feebly concave, bearing arcuate and flexuous lines of growth and six or seven granulous liræ, whereof that immediately above the suture is the largest; body-whorl acutely angular at the periphery, encircled by two sub-

equal granular ridges. Base concave near the circumference, then slightly convex, concentrically granosely ridged, the ridges nearest the umbilicus coarser than the others, and also arcuately radiately striated. Aperture irregularly subcircular, whitish. Outer lip (viewed laterally) obliquely incurved. Basal and columellar margins forming one strongly arcuate line joined above to the extremity of the labrum by a thickish callosity. Operculum unknown. Length 15 millims., greatest diameter 18.

*Hab.* Lake Tanganyika (*E. Coode Hore*).

This is perhaps the most remarkable shell of the entire collection. It is perfectly trochiform in general appearance; and the character of its sculpture agrees with that which obtains in many species of that family. I have much pleasure in associating with it the name of Dr. John Kirk, who has been a most liberal donor of specimens to the Museum, and has done much to advance our knowledge of the fauna and flora of East Africa.

### 23. LITHOGLYPHUS ZONATUS, Woodward.

*Lithoglyphus zonatus*, Woodward, Proc. Zool. Soc. 1859, p. 349, pl. 47. f. 3-30; Smith, P. Z. S. 1880, p. 350.

*Hab.* Lake Tanganyika (*Thomson*).

Several specimens of this species tend to show that it is subject to little variation, the only difference of any importance consisting in the greater or less contraction of the last volution and the consequent increase or decrease in the size of the aperture.

### 24. LITHOGLYPHUS NERITINOIDES. (Plate XXXIII. fig. 19.)

*Lithoglyphus neritoides*, Smith, Ann. & Mag. N. H. 1880, vi. p. 426.

Shell ovate, imperforate, thinnish, smooth. Spire short, purplish, whitish beneath the suture. Whorls 4, convex; last one large, elongate, semitransparent, whitish, covered with an intensely thin subolivaceous epidermis, ornamented with thread-like transverse red lines. Aperture inversely pyriform, occupying a little less than  $\frac{5}{8}$  of the entire length of the shell. Outer lip thin. Columella coated with a large callosity, extending from the upper extremity of the labrum to the base of the aperture, and spread considerably over the whorl in the umbilical region. Operculum unknown. Length  $6\frac{1}{2}$  millims., greatest diameter 5; aperture 5 long, 3 broad.

*Hab.* Lake Tanganyika (*Thomson*).

This species resembles *L. rufiflosus* in its style of ornamentation only, in other respects being totally distinct. The form reminds one of certain small species of *Neritina*; and on that account the specific name selected bears reference to that genus. The great development of the columellar callosity is very remarkable. All three specimens exhibit a dark transverse stain on the back of the body-whorl at a short distance from the suture; but whether or not this is a permanent character requires more examples in proof.

25. *LITHOGLYPHUS RUFOFILOSUS*. (Plate XXXIII. figs. 20, 20a.)

*Lithoglyphus rufofilosus*, Smith, Ann. & Mag. N. H. 1880, vi. p. 426.

Shell globose, thick, rimate, white, encircled with very fine, thread-like red lines, covered with a very thin epidermis. Whorls  $5\frac{1}{2}$ , rapidly increasing, convex, separated by a simple deepish suture, striated by the lines of growth; last whorl large, globose. Aperture also large, inversely rather pyriform, whitish, occupying about  $\frac{7}{8}$  of the entire length of the shell. Peristome continuous. Outer lip thin; base and columella thickened, the latter particularly so, and reflexed. Length 13 millims., greatest diameter  $11\frac{1}{2}$ ; aperture  $10\frac{1}{2}$  long, 6 broad.

Operculum dark brown, ovate, straighter on the inner or columellar side, paucispiral in the centre, which portion is surrounded by concentric layers.

*Hab.* Lake Tanganyika (*Thomson*).

The operculum of this species resembles that of *Tiphobia* in miniature. The centre of it is paucispiral or littorinoid; and this part is inclosed by a border which apparently consists of concentric layers. The number and distance apart of the thin red lines are subject to variation, one specimen having as many as twelve upon the body-whorl, and another as few as four.

## SYRNOLOPSIS.

*Syrnolopsis*, Smith, Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 426 (1880).

Shell subulate, smooth, imperforate. Aperture broadly sinuated at the base, with the outer lip slightly thickened, widely sinuated in the middle, and produced towards the lower part, furnished far within with one or two prominent liræ. Columella thickened, with a distinct plait at the upper part, and joined to the upper extremity of the labrum by a thin callosity. Operculum unknown.

This curious form has all the appearance of a marine genus, in fact closely resembling *Obeliscus* or *Syrnola*. The basal situation of the aperture is similar to that in some species of *Rissoina*; but the plication on the columella is wanting in that group. This is not very prominent in the adult shell; nor are the two liræ within the aperture visible, except through the semitransparent shell, unless the lip is broken away. On removing a portion of it these become apparent, the upper one being the thicker and extending parallel with the suture for about the distance of half a whorl, the lower one being shorter and more slender. The fold on the columella becomes remarkably prominent as it ascends the spire; and this may be observed by grinding off one side of the shell. As nothing is known of the animal, the systematic position of the genus is doubtful; however, it may temporarily be classed with the *Rissoidæ*.

26. *SYRNOLOPSIS LACUSTRIS*. (Plate XXXIII. figs. 21–21 b.)

*Syrnolopsis lacustris*, Smith, loc. cit.

Shell smooth, glossy, elongate, subulate, imperforate, yellowish



horn-colour, banded with white beneath the suture. Whorls 12; first two or three convex, the rest nearly flat, slowly increasing, finely striated by the very flexuous lines of growth. Suture simple, hardly oblique. Aperture small, occupying nearly  $\frac{1}{4}$  of the total length. Labrum and columella as above described. Length  $11\frac{1}{2}$  millims., diam. 3; aperture 3 long, 2 broad.

*Hab.* Lake Tanganyika (*Thomson*).

Besides the lines of growth, some species show traces of spiral striation.

27. AMPULLARIA GRADATA, sp. nov. (Plate XXXIII. figs. 22, 22 a.)

Shell globose, narrowly umbilicated, rather thin, moderately glossy, sculptured with oblique distinct lines of growth and minute spiral striæ invisible to the naked eye, yellowish olive, with several bands and lines of a greenish tint. Whorls 6, depressed and flattened above, convex at the sides. Spire gradated, worn at the purplish-brown apex, equalling about one fourth of the total length. Aperture pyriform, whitish within at the upper part, and light brown elsewhere, with the bands and lines of a vivid dark brown colour: those on the upper part stop short at a little distance from the margin of the lip, leaving a narrow space of a sulphur colour; those lower down extend almost to the edge, where they are particularly bright. Lip thin, with scarcely any internal thickening. *Columella below the umbilicus well curved*, expanded, yellowish, connected with the upper extremity of the labrum by a very thin callosity.

The following are the measurements of the three largest specimens:—

Length. millim.	Greatest diameter. millim.	Length of aperture. millim.	Width. millim.
78	72	58	37
73	67	58	36
82	72	60	38

*Hab.* Lake Nyassa, and between it and the east coast (*Thomson*).

The affinities of this species, if it be distinct, are rather with those forms found in Nilotic regions than with *A. speciosa* of Philippi from Zanzibar. The four species *A. wernei*, Philippi, *A. kordofana*, Parreyss, *A. lucida*, Parreyss, and *A. ovata*, Olivier, are very closely related; and it is a matter of impossibility to define the limiting characters of any of them. The present species also may only be another form of the same shell. Like *A. wernei* and *A. kordofana*, the whorls are flattened at the top, so that the spire has a gradated appearance; but from these it may be distinguished by its broader and shorter aperture and the considerably greater arcuation or incurvation of the columella; or the form may be described as more pyriform, being narrower above and broader below than in either of those two species. The banding within is of a deep tortoiseshell brown, and only extends to the margin of the tip, along the base, and about halfway up the side.

28. *LANISTES PURPUREUS*, Jonas.

*Ampullaria purpurea*, Jonas, Archiv f. Naturgesch. 1839, p. 342, pl. 10. f. 1; Philippi, Conch.-Cab. p. 22, pl. 6. fig. 1.

*Bulimus tristis*, Jay, Cat. Shells, p. 121, pl. 7. fig. 1.

*Meladomus olivaceus*, H. & A. (non *Paludina olivacea*, Sowerby), Genera, vol. i. p. 349, vol. iii. pl. 37. f. 6-6 b.

*Meladomus bulimoides*, Swainson, Treatise on Malacology, 1840, p. 340 (probably).

*Hab.* Lake Nyassa, and between it and the east coast (*Thomson*).

One specimen from the lake differs from the normal form of the species in having the whorls flatter and the lines of growth somewhat puckered beneath the suture. Another shell, found further eastward, has a very unusually conical form, with the volutions also exceptionally flat.

The species appears to be very abundant at Zanzibar, and has also been found in many localities further south, in Mozambique.

29. *LANISTES AFFINIS*, Smith. (Plate XXXIV. fig. 23.)

*Lanistes affinis*, Smith, Proc. Zool. Soc. 1877, p. 716, pl. 74. fig. 7.

*Hab.* Lake Nyassa (*Simons & Thomson*).

When I described this species I had but a single shell before me, which now proves to be only a small example of it.

The series brought home by Mr. Thomson show that it attains a considerably larger size. The finest specimen is 60 millims. in length, and has a considerable part of the surface strongly mal-leated, which, judging from the rest of the specimens, appears to be quite an exceptional feature. But one constant character, which may serve to part it from its congeners, is the narrow orange-yellow line which borders the volutions immediately beneath the suture. *L. ovum*, Peters, has a more elevated spire and smaller aperture; and *L. ellipticus*, Martens, appears to be (judging from the figure, Novitates Conchol. vol. ii. pl. 70. figs. 9, 10) more narrowly umbilicated, with the last whorl and aperture considerably narrower at the base. The penultimate whorl, too, of the latter is very narrow in proportion to the body-whorl.

The operculum is very thin, pale, horny, and considerably smaller than the aperture. The odontophore extracted from the dried remains of an animal agrees exactly with that of *L. ovum* (*Troschel*, 'Gebiss der Schnecken', vol. i. p. 90, pl. 6. fig. 11).

30. *LANISTES*, sp., jun.

*Hab.* Lake Tanganyika (*Thomson*).

Only a single immature specimen of a species of this genus was found. This is the first record of its occurrence in the lake.

The specimen has a depressed spire, but not so flattened as *L. nyassanus*, is rather widely umbilicated, and consists of three whorls. It closely resembles the apical portion of *L. solida* described by me from Lake Nyassa.

31. MELANIA (SERMYLA) ADMIRABILIS. (Plate XXXIV. fig. 24.)

*Melania (Sermyla) admirabilis*, Smith, Ann. & Mag. N. H. 1880, vi. p. 427.

Shell elongate, thick, turreted, whitish, stained by a brownish earthy deposit. Whorls probably about 10, very convex, and much constricted beneath at the oblique very deep suture, unequally bipartite by a shallow furrow a little beneath the suture, bearing strong obliquely arcuate ribs, which at the upper end terminate in a tubercle above the shallow groove which crosses them; they vary in number considerably, in one specimen numbering as few as fifteen on the last whorl, and in another as many as twenty-one; last whorl with the costæ abruptly terminating at the middle, beneath which it is girded by five or six strong concentric liræ, which are of equal thickness and equidistant. Aperture ovate, acuminate above, narrowed and effuse at the base. Columella oblique, arcuate at the lower part, thickened and united to the upper end of the outer lip by a thin callosity. Length 47 millims., diameter 14; aperture 14 long and 8 wide.

*Hab.* Lake Tanganyika (*E. Coode Hore*).

This species is remarkable for its solidity, and the strength of the costation.

32. MELANIA TUBERCULATA, Müller.

*Hab.* Lake Tanganyika (*Thomson*).

Again this ubiquitous species presents itself. It is without a rival in the extent of its geographical distribution, having been recorded from Malta, North, East, and West Africa, Lake Nyassa, Madagascar, Mauritius, Syria, Ceylon, Persia, Arabia, Mesopotamia, Siam, Java, island of Formosa, and Australia. The Tanganyika specimen is rather strongly cancellated, and exhibits the red dotting upon the transverse or spiral ridges.

33. MELANIA TANGANYICENSIS. (Plate XXXIV. fig. 25.)

*Melania tanganyicensis*, Smith, Annals, loc. cit.

Shell small, turreted, solid, almost black, with a broad light-chestnut band occupying the middle of the whorls; these are about six in number, flat at the sides, and roundly shouldered above, strongly ribbed, the ribs being broad but not much elevated; the body-whorl is large in proportion to the rest of the shell, and has a few transverse sulci at the base. Aperture almost half as long as the entire shell. Columella well curved, pale and thickened towards the base. Length  $7\frac{1}{2}$  millims., diam.  $2\frac{3}{4}$ ; aperture  $3\frac{1}{2}$  long.

*Hab.* Lake Tanganyika (*Thomson*).

In this instance also the species is represented by a single specimen only; and that too is in worn condition. Its characters, however, are such that it can readily be recognized from allied forms, none of which approximate very closely. Certain varieties of *M. polymorpha*, a Nyassa species, exhibit a close relationship in form,

but differences of coloration and sculpture. *M. tanganyicensis* has the upper part of the whorls of the spire somewhat swollen and almost black, the lower half being light chestnut, the black portion beneath this in each whorl being concealed by the upper part of the succeeding volution.

34. MELANIA (MELANELLA) NASSA, Woodward. (Plate XXXIV. figs. 26-26 b.)

*Melania (Melanella) nassa*, Woodward, P. Z. S. 1859, p. 349, pl. 47, f. 1; Smith, P. Z. S. 1880, p. 348; Reeve, Con. Icon. fig. 216; Brot, Con.-Cab. pl. 6. f. 7.

This Tanganyikan shell is subject to much variation, both in form and sculpture. The number of plicæ in two of the specimens collected by Mr. Thomson is exceptionally small, there being but ten upon the last whorl. In contrast to this another example has twenty-six upon the same volution. One of the two former is also abnormal in another respect, namely in having the transverse ridges very narrow, thread-like, continuous on and between the plications, and of a brown colour. In the other they are whitish, interrupted by brown dots upon the lower part of the last whorl. The solid marine character of this species distinguishes it from all others, and when the operculum, at present unknown, and the animal are examined, it will probably receive distinct generic rank.

Since writing the above, another series of this remarkable species has been sent to the Museum by Dr. Kirk of Zanzibar. Among this set are some exceptionally large specimens, peculiar also for a sub-truncation near the base of the columella. This I imagine would be concealed when the shell arrived at maturity by a deposition of callus. Although of very large size, not one of these appears to be adult, judging from the thickness of the outer lip. The number of transverse liræ on the last whorl is unusually large; and the whorls are broadly and flatly gradated.

35. MELANIA (—?) HOREI. (Plate XXXIV. fig. 27.)

*Melania (—?) horei*, Smith, Annals & Mag. Nat. Hist. ser. 5, vol. vi. p. 427 (1880).

Shell ovate-conical, smooth, brown, with a narrow white line beneath the suture. Spire conical, a trifle excentric, inclining very slightly to the right (the aperture being towards the eye and downwards). Whorls  $6\frac{1}{2}$ , scarcely convex, exhibiting faint incremental striæ. Suture simple; last whorl rising somewhat upon the preceding near the aperture, then suddenly descending to the margin of the labrum, furnished with a slight basal thickening, aperture ovate, rather acuminate above, purplish brown, occupying about  $\frac{3}{4}$  of the entire length. Lip a little thickened, especially towards the suture, and somewhat patulate near the base. Columella whitish, moderately arcuate, united to the upper extremity of the labrum by a thin callosity. Length 14 millims., diam.  $6\frac{1}{2}$ ; aperture 6 long, 4 broad.

*Hab.* Lake Tanganyika (*Hore*).

This is another instance of a species from Tanganyika having very much the appearance of a marine form. At present the operculum and animal are unknown; and therefore I place it provisionally in the genus *Melania*; for it approaches in some respects certain aberrant forms of that group, *e. g.* *M. brevis*, d'Orbigny, and *M. parva*, Lea.

The colour is not uniform in tint; for beneath the whitish infra-sutural line the brown is paler, then comes a darker zone gradually blending into a paler one. The body-whorl too has an ill-defined basal zone.

36. *TIPHOBLA HOREI*, Smith. (Plate XXXIV. fig. 28.)

*Tiphobia horei*, Smith, Proc. Zool. Soc. 1880, p. 348, pl. 31. f. 6-6b.

When describing this very remarkable form, I was unable to give any account of the operculum. Fortunately, one of the specimens brought home by Mr. Thomson had that appendage adhering to the interior. It is almost black, horny, elongate-subovate, rather concave exteriorly, paucispiral in the centre, which portion is surrounded by apparently concentric layers. The lower side has a glossy border, which is broadest on the outer margin, narrow and slightly thickened on the inner or columellar edge.

It is not sufficiently large to close the aperture of the shell as in the genus *Paludina*; and the paucispiral character of the early stage of its growth confirms my original opinion that the species should be classed with the *Melaniidæ*. It is by no means a common shell according to the observation of Mr. Thomson, being restricted to a certain part of the lake, and even there not abundant. The absence of an epidermis is still maintained in the specimens now under examination; and this very remarkable peculiarity may be considered eventually a sufficient distinction to separate the genus from the *Melaniidæ*.

37. *NEOTHAUMA TANGANYICENSE*, Smith.

*Neothauma tanganyicense*, Smith, Proc. Zool. Soc. 1880, p. 349, pl. 31. figs. 7-7c.

In this instance also I am enabled to give an account of the operculum. It is of a reddish colour, and normally paludinoïd, the nucleus being situated about midway between the inner or columellar border and the centre. One of the specimens is unusually acutely carinate around the centre of the body-whorl, and very deep in the suture.

38. *PALUDINA CAPILLATA*, Frauenfeld.

*Paludina capillata*, Frauenfeld, Proc. Zool. Soc. 1865, p. 659; 1877, p. 717, pl. 74. figs. 3-4.

*Hab.* Lake Nyassa (*Kirk*); between it and the east coast (*Thomson*).

39. *PALUDINA ROBERTSONI*, Frauenfeld.

*Paludina robertsoni*, Frauenfeld, P. Z. S. 1865, p. 659; Smith, P. Z. S. 1877, p. 717, pl. 74. f. 5, 6.

*Hab.* Same as the preceding.

The specimens collected by Mr. Thomson are greenish olive, with the angulation of the whorls strongly marked, and the columella of a bluish tint.

40. *PALUDOMUS FERRUGINEUS*, Lea. (Plate XXXIV. fig. 29.)

*Melania ferruginea*, Lea, Proc. Zool. Soc. 1850, p. 182; Reeve, Con. Icon. fig. 147; Martens, Von der Decken's Reisen in Ost-Afrika, vol. iii. p. 153.

*Melania zanguebarica*, Petit, Journ. de Conch. vol. ii. p. 263, pl. 7. f. 1.

*Hab.* Between Lake Nyassa and the east coast (*Thomson*); Umba (*Craven*); Zanzibar (*Lea*).

The specimen figured in the 'Conchologia Iconica' is small in comparison with those collected by Mr. Thomson, the largest of which, if the apex were complete, would have a length of about 42 millims, and in diameter it is 17. In the original description Lea describes the single shell which was submitted to him as "ferruginea," and does not mention the dark zone round the middle of the body-whorl. This, although very obscure, is visible in the specimen referred to, now in the British Museum. In shells in good condition two other bands are observable within the aperture—one above, close to the suture, and the other near the base. *Melania zanguebarica* of Petit appears to be the same as this species; and *Paludomus africanus* of Martens, if not identical, offers but slight distinctions.

41. *PLANORBIS SUDANICUS*, Martens.

This species was also recorded in my previous paper (Proc. Zool. Soc. 1880, p. 349) on Lake-Tanganyika shells.

42. *SEGMENTINA (PLANORBULA) ALEXANDRINA*, Ehrenberg, var. *TANGANYICENSIS*. (Plate XXXIV. figs. 30-30 b.)

Shell moderately depressed, equally umbilicated on both sides, obtusely angular at the periphery, distinctly keeled on the top of the whorls, and angulated around the umbilicus, brownish horn-colour, spirally finely striated and more distinctly by the incremental lines. Whorls 5; aperture irregularly lunate. Peristome strengthened within with a whitish rib. Height of largest specimen 4 millims., greatest diameter 12; aperture 4 high,  $3\frac{1}{2}$  broad. Another is 10 wide and  $3\frac{1}{2}$  high.

*Hab.* Lake Tanganyika (*Thomson*).

The four shells before me are constant in the characters above given, and might therefore be specifically distinguished from the *P. alexandrina* of Ehrenberg. The normal form of that species has the whorls rounded above, is a trifle flatter, and consequently not

so deeply umbilicated and less acutely carinated around the umbilicus. The teeth, which frequently are present within the aperture of the Egyptian species, do not exist in either of the Tanganyikan specimens; but the character of the rib bordering the peristome is similar in both forms.

43. *LIMNÆA NATALENSIS*, Krauss.

*Limnæa natalensis*, Krauss, Südafrik. Moll. p. 85, pl. 5. f. 15; Küster, Con.-Cab. pl. 6. f. 1-3; Martens, Mal. Blät. 1866, pl. 3. f. 8, 9.

*Hab.* Lake Tanganyika (*Hore & Thomson*).

This species has a very extensive range, having been recorded from Natal (*Krauss*), Abyssinia (*Blanford* and *Martens*), Lake Nyassa (*Kirk* and *Simons*); and from the west side of the continent at Benguela the same species, apparently, has been described under the name of *L. orophila*.

44. *PHYSA*, sp.

*Hab.* Lake Tanganyika (*Thomson*).

This genus, not previously recorded from this locality, is represented by a single, probably young shell. It is very much of the same character as *P. nyassana*, described in the Proc. Zool. Soc. 1877, p. 717, pl. 75. fig. 16-17. However, it is distinct; for on comparison with a specimen of that species of similar size, it proves to consist of fewer whorls, has a less prominent spire, and narrower umbilicus.

45. *CYRENA (CORBICULA) RADIATA*, Parreyss, var.?

*Cyrena radiata*, Parr., Philippi, Abbild. ii. p. 4, pl. i. f. 8; Clessin, Conch.-Cab. (*Corbicula*) pl. 28. f. 16-18.

*Hab.* Lake Tanganyika (*Thomson*).

The shells from the lake are more finely and closely ribbed than the specimens from the White Nile described by Philippi, and the hinge is a trifle stouter, but in all other respects agree very well.

The shell figured by Sowerby in a wretched monograph in the 'Conchologia Iconica,' under the name of "*Cyrena radiata*, Hanley, —? MS." (pl. xi. f. 47 *a, b*), is quite distinct from this species; but fig. 47*c* on pl. xiii. may be a bad representation of it.

This species was recorded by me from Lake Nyassa (P. Z. S. 1877, p. 718). On comparing the specimens from that locality with those from Tanganyika it becomes a matter of uncertainty whether they should be regarded conspecific. The shells from the latter lake are longer from the umbo to the ventral margin, and consequently less transversely oblong; their colour is a deeper violet within, whilst the Nyassa specimens are fleshy-brown, varied by the external umbonal and lateral violet rays. Such being the case, I prefer to consider the shells before me as doubtfully belonging to this species, until an opportunity occurs of studying this most difficult genus more thoroughly.

46. *PLEIODON SPEKEI*, Woodward. (Plate XXXIV. figs. 31, 31a.)

*Pleiodon spekei*, Woodward, Proc. Zool. Soc. 1859, p. 348, pl. 47. f. 2; Smith, P. Z. S. 1880, p. 350; Reeve's Conch. Icon. vol. xvi. f. 2; Küster's Conch.-Cab. (*Iridina*) pl. 70. f. 1.

*Hab.* Lake Tanganyika (*Thomson*).

Of this fine species the present collection contains two specimens—one quite young, and the other half-grown. The younger shell shows that the teeth on the hinge-line are early developed; and both specimens are broader posteriorly than the adult form and less acuminate at the extremity. The interior of the valves is bluish white, faintly tinged with rose towards the umbones.

47. *MUTELA EXOTICA*, Lamarck.

*Mutela exotica*, Lamarck, Anim. s. Vert. ed. 2, vol. vi. p. 571; Reeve's Con. Icon. (*Iridina*) fig. 2.

*Iridina nilotica* (Férussac), Sowerby, Zool. Journ. vol. i. pl. 2; id. Con. Icon. f. 4; Küster, Con.-Cab. pl. 25. f. 3.

*Iridina elongata*, Sowerby, Genera, fig. 1; id. Conch. Icon. f. 1.

*Hab.* Lake Tanganyika (*Thomson*).

None of the specimens exceeds  $3\frac{1}{2}$  inches in length; and one or two of them are indistinctly wrinkled perpendicularly across the valves a short distance from the umbones.

48. *SPATHA TANGANYICENSIS*, Smith. (Plate XXXIV. fig. 32.)

*Spatha tanganyicensis*, Smith, Proc. Zool. Soc. 1880, p. 350, pl. 31. figs. 8, 8a.

The specimen figured in the above work proves to be an unusually broad form, having the posterior extremity much less acuminate than in what appears to be the most common or typical form of the species. In describing the young shell I suggested that the narrow rostrated form would become modified as the animal increased it, and that the dorsal alation would also enlarge. This surmise is to a great extent upheld by the series of specimens before me. However, the shape remains much more slender than I supposed; but the dorsal wing does increase considerably. The colour of the epidermis varies with age—in young shells generally being yellowish green, and becoming darker or of an olive-brown when more mature. The form of the anterior end is not faithfully described by me or correctly depicted in the figure of the adult shell. The only full-grown specimen then before me was broken at that particular part. The series now at hand shows that the angle formed by the dorsal margin (which slightly descends near the extremity) and the upward sweep of the anterior boundary is much more acute, the latter sometimes being slightly sinuated just below the angle.

49. *UNIO NILOTICUS*, Cailliaud.

This species has been previously recorded from Tanganyika, in my former paper. Several additional specimens show that the form and general colouring of the exterior of examples from this particular



locality vary considerably; however, not one of them takes the form of *U. aegyptiacus* of Férussac, which Jickeli unites with this species. All have the more rhomboidal form and less central umbones of *U. niloticus*; and the epidermis varies from dark olive-brown to yellowish olive or uniform brown. Some of the specimens are indistinctly rayed; and others have a few raised epidermal ridges radiating from the umbones towards the anterior end of the ventral margin. Without exception the valves in front of the umbones are corrugated; but posteriorly there is but rarely any trace of such ornamentation.

50. *UNIO BURTONI*, Woodward. (Plate XXXIV. figs. 33–33b.)

*Unio burtoni*, Woodward, Proc. Zool. Soc. 1859, p. 349, pl. 47. fig. 1.

*Hab.* Tanganyika (*Hore and Thomson*).

The collection brought home by Mr. Thomson contains a series of specimens which I believe are varieties of this species. Not one of them corresponds with the typical form, of which the Museum possesses two examples—one from the Cumingian collection, the other, the type, presented by Capt. Speke. Both these shells are in a considerably worn condition, scarcely a vestige of the epidermis remaining. Their form, too, is more transverse, flatter; and the umbones are less prominent. Among the present series there are two varieties, one much more strongly sculptured than the other. The subgranular character of this ornamentation is somewhat different from that on the typical shells; but some allowance must be made for this, owing to their worn condition. Their outline, too, is no doubt modified to a certain extent from the same cause. The colour of the interior varies from white to uniform rich brownish purple. Both varieties vary in this respect; and intermediate grades of coloration are found in each series. The exterior of the valves also presents difference of colour, in some specimens being of a yellowish tint indistinctly radiated with fine green lines; others are of the same general colour, but lack the green rays; and, again, certain specimens exhibit more of an olivaceous exterior more or less varied with green, the latter consisting of indistinct fine radiating lines.

As a whole, the form of Mr. Thomson's specimens is rather more convex and deeper from the umbo to the ventral margin than that of the two typical specimens; still, as I have previously stated, this in the latter case may be the result of their worn state.

Other specimens, collected by Mr. Hore near Ujiji and recently forwarded to the British Museum by Dr. John Kirk, approach the typical form more closely. The outline varies very much, judging from this series, the position of the umbones also being in some much more forward than in others. The freshest of these, having the epidermis to some extent preserved, shows that the species is ornamented with fine green radiating lines. The amount of sculpture is intermediate between that found on the more rugose variety

collected by Mr. Thomson; and in character it is also intermediate, being less granulose than some, yet hardly agreeing with that of the type specimen. These slight differences are probably modifications produced by difference of locality; for the shells collected by Mr. Thomson were from the southern end of the lake, whilst those obtained by Captain Speke and Mr. Hore were found further north, near Ujiji.

51. *UNIO NYASSAENSIS*, Lea, vars. (Plate XXXIV. figs. 34–34b.)

*Unio nyassaensis*, Lea, Proc. Acad. Nat. Sci. Philad. 1864, p. 108; Journ. Acad. Nat. Sci. Philad. 1866, vol. vi. p. 33, pl. 12. f. 32; Smith, P. Z. S. 1877, p. 719; Sowerby, Conch. Icon. sp. 224, f. a, b (*U. nyassæ*), Errata and Index (*U. nyassensis*).

Var. = *U. kirkii*, Lea, l. c. p. 108; Journal, p. 32, pl. 12. f. 30.

Var. = *U. aferula*, Lea, l. c. p. 109; Journal, p. 34, pl. 13. f. 34.

*Hab.* Lakes Tanganyika and Nyassa (*Thomson.*)

*Var.* TANGANYICENSIS (fig. 34 a).

There are but three valves in Mr. Thomson's collection, which I think may possibly belong to this species. They differ from the normal form in being rather longer transversely, of a pinkish-red colour within, and without also, beneath the greenish epidermis. The latter is finely rayed with green. The sculpture is very similar; but the corrugation does not extend quite so far down the valves.

*Var.* from Nyassa (fig. 34b).

Mr. Thomson's specimens are more triangular than those collected by Dr. Kirk at the same locality, having the hinder extremity considerably produced and pointed. Like the three valves from Lake Tanganyika, they are rather smoother than typical specimens; and some of them are of the same pinkish-red colour. Although, as a rule, very different in form from that figured by Lea, still great allowance has to be made for the great variation that obtains among freshwater genera, and especially in the outline of species of *Unio*; and consequently I prefer to consider the shells in question as varieties of this species rather than distinct forms.

52. *UNIO TANGANYICENSIS*, Smith. (Plate XXXIV. fig. 35.)

*Unio tanganyicensis*, Smith, Proc. Zool. Soc. 1880, p. 351, pl. 31. f. 9, 9a.

As in the case of *U. Jurtoni*, so also in this species, the specimens now before me differ from the shells described previously. They are less distinctly radiated with green, produced and beaked posteriorly very considerably, and also exhibit a distinct sinuation near the posterior end of the ventral margin. The latter feature, however, exists in some of the typical shells, though in a considerably less degree. They are too, as a rule, narrower from the umbo to the opposite side. The absence of the green lines is to a great extent accounted for by the worn condition of the exterior of most of the specimens; for as soon as the epidermis is removed they vanish with it, being only epidermal markings.

53. *UNIO THOMSONI*. (Plate XXXIV. fig. 36.)

*Unio thomsoni*, Smith, Ann. & Mag. Nat. Hist. 5th series, vol. vi. p. 430 (1880).

Shell ovate, rather acuminate behind, concentrically striated, granosely radiately distinctly corrugated in the dorsal region on *both* sides of the umbones. The latter also prettily wrinkled in a zigzag manner, small, rather acute, and placed well forward. Colour yellowish or pinkish, faintly rayed with an obscure dull pinkish hue, more or less hidden by a thin olivaceous epidermis. Valves not deep, with a small anterior lunule, and a rounded narrow ridge on the posterior slope, with a shallow depression on each side. Anterior end regularly curve, posterior acuminate, ventral margin considerably arcuate and indistinctly sinuate near the hinder end. Anterior teeth small, irregularly bifid in one valve and trifid in the other, roughened and striated; posterior teeth slender, occupying about half the extent of the slope from the beaks to the hinder extremity. Interior of valves variable; sometimes the nacre is bluish white rayed with pinkish, and in other instances more uniformly purplish brown. Length 15 millims., width 21, diam. 10.

*Hab.* Lake Tanganyika (*Thomson*).

In general aspect this species is similar to *U. tanganyicensis*, but may be recognized by its smaller umbones, the radiating wrinkling on *both* sides of them, and the greater amount of it upon them, the greater curve of the ventral margin, the broader, more ovate shape, and the absence of green radiating lines.

Only three specimens of it were collected; but they agree in the above particulars, and have a peculiar *tout ensemble*, which immediately arrests notice if mixed with specimens of *U. tanganyicensis*. The two depressions with a rounded ridge between, down the hinder dorsal area, is another feature not occurring in that species.

54. *UNIO HOREI*. (Plate XXXIV. fig. 37.)

*Unio horei*, Smith, *ibid.* p. 429.

Shell oblong, subrhomboidal, a trifle broader behind than in front, inequilateral, rather thin, pearly, covered with a yellowish-olive epidermis. Hinge-line straightish; anterior end broadly curved; ventral margin only slightly arcuate; hinder side oblique, very feebly curved, forming an angle above with the hinder dorsal slope, and a curve with the basal margin rather more sudden than that at the opposite end of the valves. The latter are concentrically striated, zigzagly corrugated towards the umbones, and radiately plicated on each side of them; and down the hinder dorsal area there are two shallow depressions, which radiate from the umbones. Interior white, pearly; anterior and posterior teeth thin, lamellar; scars shallow, anterior the deeper, subquadrate. Length  $16\frac{1}{2}$  millims., width 25, diam.  $9\frac{1}{2}$ .

*Hab.* Lake Tanganyika (*Thomson*).

The single specimen of this interesting species, whose measurements are above given, is in all probability but the young form of a shell which attains a much larger size. However, it is quite distinct

from the other species of the genus known as inhabiting the lake, and is easily recognized by its form and thin lamellar teeth. *U. bakeri*, H. Adams, from Lake Albert Nyanza, approaches the present species, but is much longer and much more corrugated upon the surface.

## EXPLANATION OF THE PLATES.

## PLATE XXXII.

- Fig. 1, 1 a. *Cyclostoma insulare*, vars., p. 277.  
 2, 2 a, 2 b. *Helix* (*Navina*?) *nyassana*, p. 278.  
 3, 3 a. *Helix* (*Trochonanina*) *mozambicensis*, var., p. 279.  
 4, 4 a. *Streptaxis gigas*, p. 279.  
 5, 5 a. — *craveni*, p. 280.  
 6, 6 a. — *mozambicensis*, p. 280.  
 6\*. *Ennea laevigata*, p. 281.  
 7, 7 a, 7 b, 7 c. *Bulimus* (*Rhachis*) *braunsii*, p. 281.  
 8. *Bulimus notabilis*, p. 282.  
 9. — (*Buliminus*) *kirki*, p. 282.  
 10. *Achatina humillei*, p. 282.

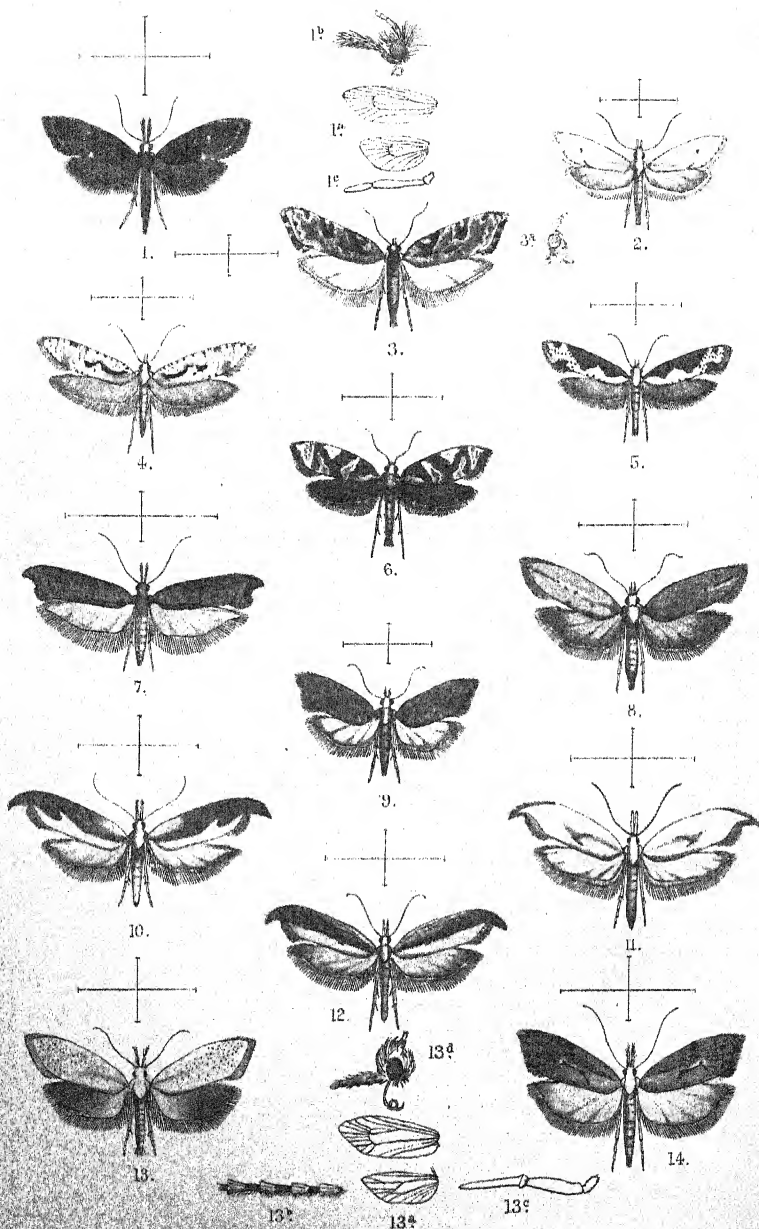
## PLATE XXXIII.

- Fig. 11. *Achatina craveni*, p. 283.  
 12. — *thomsoni*, p. 283.  
 13. — (*Limicolaria*) *caillaudi*, p. 284.  
 14, 14 a. *Achatina* (*Limicolaria*) *rectistrigata*, p. 284.  
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 17, 17 a, 17 b. *Limnotrochus thomsoni*, p. 285.  
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## PLATE XXXIV.

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 31, 31 a. *Pleiodon spekei*, p. 296.  
 32. *Spatha tanganyicensis*, p. 296.  
 33, 33 a, 33 b. *Unio burtoni*, p. 297.  
 34, 34 a, b. *Unio nyassaensis*, p. 298.  
 35. *Unio tanganyicensis*, p. 298.  
 36. — *thomsoni*, p. 299.  
 37. — *horei*, p. 299.

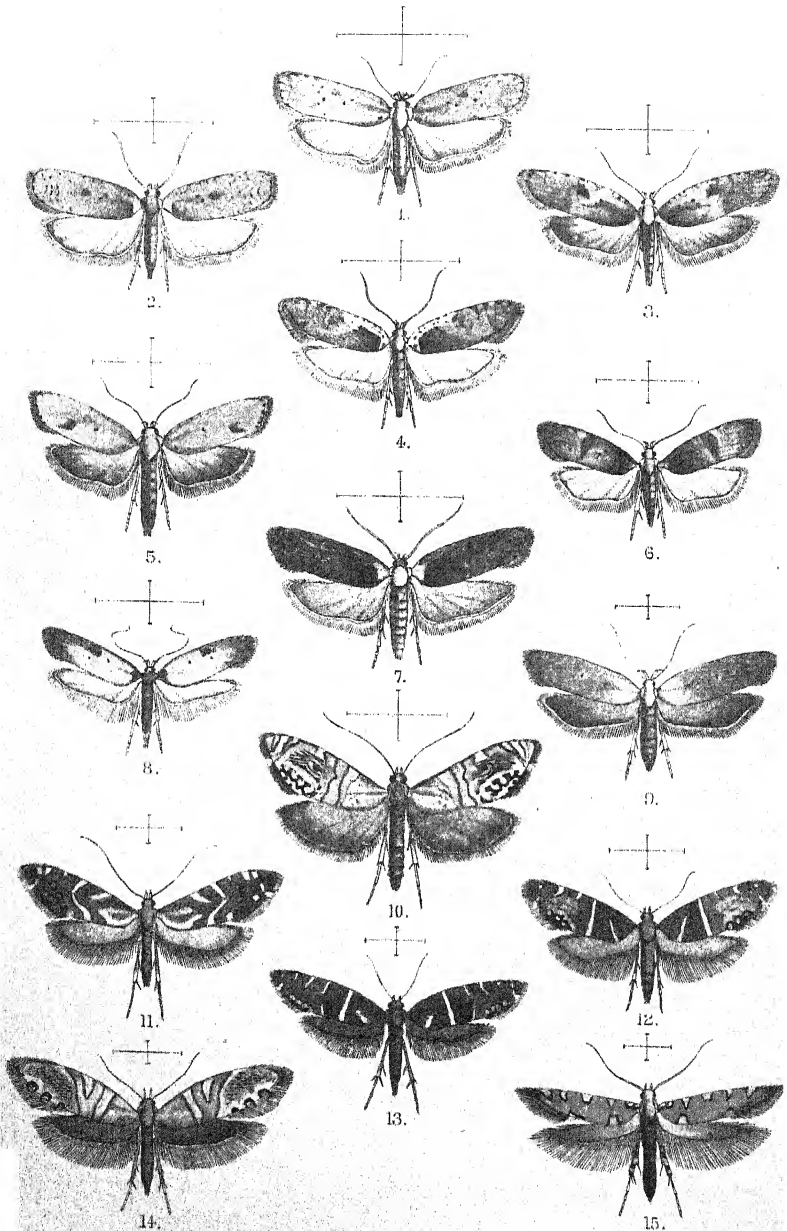




Edwin Wilson, del. et lith.

Miner Bros, imp.





Edwin Wilson del. et lith.

NEW NORTH AMERICAN TINEIDÆ

Miner's Bros., imp.



4. On some North-American Tineidæ. By THOMAS, Lord  
WALSINGHAM, F.Z.S.

[Received February 15, 1881.]

(Plates XXXV., XXXVI.)

In a paper published last year in the Proceedings of this Society, I endeavoured to contribute a few observations upon synonymy, calculated to afford some assistance towards a revision of the North-American Tineidæ. I now propose to describe a few more new species from that country, and to direct attention to the synonymy of some others of the genera to which they belong. Of the ten genera noticed in this paper, four only have at present been recognized by American authors. The claims of one other to a footing in the New World have hitherto rested upon Mr. Walker's record of a single specimen not now to be found in the British Museum. Two European genera are now, for the first time, mentioned as occurring there, unless one of these has possibly been recharacterized in America under another name; and three, so far as I am able to determine, are new. Some species known in Europe are also now recorded from California and Oregon.

PHRYGANEOPSIS, gen. nov.

*Caput hirsutum; antennæ pubescentes; haustellum mediocre; palpi maxillares plicati; palpi labiales capite ter longiores, porrecti, supra et infra hirsute pilosi. Alæ anticae a basi dilatatae, costa subarcuata, apice depresso; margo apicalis obliquus. Alæ posticae latae. Abdomen anguste compressum. Tibiæ hirsute pilosae, aliquot incrassatae.*

Head rough; antennæ indented at the joints, pubescent in both sexes, more strongly in the male; ocelli none; tongue of medium length, slightly scaled; maxillary palpi folded. Labial palpi projecting, three times the length of the head, slightly drooping; the second joint scarcely thickened beyond the middle, the apical joint rather more than half the length of the second, roughly clothed to the points with coarse hair-like scales.

♂. Fore wings rather broad, the costa slightly arched, depressed towards the apex (broader and subfalcate in the female); apical margin oblique. Hind wings broad, not perceptibly indented below the apex; fringes long. Abdomen laterally compressed, projecting considerably beyond the hind wings. Tibiæ roughly hairy, somewhat thickened.

This somewhat aberrant form should probably be placed somewhere near the genus *Incurvaria*. It differs very considerably in the form of the palpi, but approaches that genus in the neururation and in the form of the abdomen, as also somewhat in general appearance.

I have failed to find, in the writings of either Mr. Clemens or Mr. Chambers, any generic description which would rightly apply to its peculiar structure and appearance; nor is there any European form which corresponds to it.

PHRYGANEOPSIS BRUNNEA, sp. nov. (Plate XXXV. fig. 1, 1a, 1b, 1c).

*Capite ochraceo, palpis brunneis, antennis sordidis; alis anticis cum ciliis chocolate brunneis, purpureo vel viridi-purpureo subnitidis, costa dimidia exteriori dilute ochraceo maculata, puncta disci et puncto in medio marginis dorsalis dilute ochraceis; alis posticis ♂ brunneis, ♀ subpurpureis.*

Head roughly clothed, ochreous; palpi dark brown, slightly depressed, extending three times the length of the head beyond it. Antennæ pubescent in both sexes, dirty whitish brown above in the ♀.

Fore wings and cilia dark chocolate-brown, with a gloss of purplish in the ♂ and of greenish purple in the ♀, especially noticeable where any abrasion of the scales has occurred; the costa is faintly marked on its outer half with two or three groups of pale ochreous scales, the last of which lies above the apex at the commencement of the costal cilia; there is a spot of the same colour on the middle of the dorsal margin, with a small pale discal spot above and beyond it. Hind wings brown in ♂, purplish in the ♀. Legs and abdomen of the same colour; the feet slightly paler.

Expanse, ♂ 20, ♀ 25 millim.

Three specimens (2 ♂, 1 ♀) on the coast of Klamath county, California, June 1872.

#### Genus CALANTICA (Zeller).

CALANTICA POLITA, sp. nov. (Plate XXXV. fig. 2.)

*Capite crinito et thorace candidis; antennis (excepta basi candida) cinereis; palpis decumbentibus, articulo secundo cinereo, apicali candido; alis anticis nitidis, subcaeruleo-candidis, puncto in fine cellulae fusco, costae basi anguste cinerea, strigula dorsali obliqua post medium cinerea, ciliis subcinereis; posticis saturate plumbeo-cinereis, ciliis dilutioribus.*

Head roughly clothed, together with the thorax shining white; the palpi depressed, having the second joint cinereous, the apical joint thickly clothed, white above, touched with cinerous beneath. Antennæ white at the base, cinereous beyond.

Fore wings shining white, with a faint bluish tinge; a fuscous dot at the end of the cell; the base of the costa narrowly cinereous, and a small cinereous oblique streak beyond the middle of the dorsal margin, but preceding the discal spot to which it points; this streak, in some specimens, is obsolete; the cilia are slightly tinged with cinereous, and in some specimens have a row of very faint minute cinereous dots at their base, along the apical margin. Hind wings very pale greyish cinereous, with paler cilia. Underside of the fore wings cinereous, of the hind wings greyish.

Expanse 15 millim.

The only points of structure in which this species appears to differ from the European representatives of the genus *Calantica* are the greater length of its palpi and the less thickened tibiae of the first pair of legs.

## ARÆOLEPIA, gen. nov.

*Capilli in capite et fronte hirsuti. Palpi labiales breves, articulo secundo incrassato, supra hirsute crinito, tertio inconspicuo.*

*Antennæ pubescentes. Alæ anticae elongatæ, ad angulum analem dilatate; costa non arcuata; margo apicalis obliquus, vix concavus.*

*Alæ posticæ sat latæ, aliquot acuminatæ.*

Head rough above and in front, the scales on the face projecting forwards in a compact tuft; those above the eyes erect and less closely compressed; ocelli present. Antennæ slender, pubescent, about half the length of the fore wings; basal joint short, slightly enlarged. Maxillary palpi none. Labial palpi short, thickly clothed with coarse scales, which project more widely above than beneath; the second joint somewhat thickened; the apical joint short and nearly concealed, well clothed to the apex.

Fore wings elongate, narrow at the base, gradually widened towards the anal angle, which is well defined, especially by the form of the projecting cilia, which give the wing a somewhat hatchet-shaped appearance not entirely due to the wing-structure. The apical margin is oblique, the cilia at the apex slightly rounded.

Hind wings about the same width as the widest part of the fore wings, somewhat produced and acuminate at the apex, with very long cilia, especially about the abdominal fold.

This genus approaches *Plutella* (Schranck) and *Plutelloptera* (Chambers), but differs from the first in the form of the palpi, and from the last in the shape and neuration of the wings. It has no "independent elongate triangular cell," as described and figured by Mr. Chambers (Journ. Can. Soc. Nat. Hist. Jan. 1880, pp. 3-23, fig. 7).

## ARÆOLEPIA SUBFASCIELLA, sp. nov. (Plate XXXV. fig. 3, 3a.)

Head rough above and in front, white, with a fuscous streak along the middle of the crest. Antennæ slender, scarcely pubescent, distinctly spotted above with white and fuscous; the basal joint fuscous. No maxillary palpi discernible. Labial palpi short, the second joint roughly clothed above; the apical joint short, partly concealed, white above and at the tips, dingy fuscous at the sides and beneath.

Fore wings elongate, widened towards the apex, the anal angle somewhat distinct; apical margin oblique, not emarginate below the apex; the costal and dorsal margins both somewhat bulged near the base. Ground-colour of the fore wings greyish white, profusely speckled and clouded with greyish fuscous, which is especially collected in two indistinct broken fasciæ obliquely inverted, the one from before, the other from beyond the middle of the costa; the second of these is distinctly interrupted beyond the middle of the disk, the dorsal portion being narrower and less conspicuous than the costal; the first is not distinctly interrupted, but the lower or dorsal portion of it becomes suddenly darker than the costal half. Around the apex and apical margin are several square greyish fuscous spots or patches, running completely through the whitish cilia—three costal,

of which the first forms the outer edge of the second fascia, and about five marginal, the last being in the cilia at the anal angle; these are also conspicuous on the underside.

Hind wings scarcely emarginate below the apex, very pale brownish fuscous, slightly shaded about the margins and at the base of the pale cilia.

The thorax is of the same colour as the darkest portions of the fore wings; the abdomen faintly banded, the anal tufts lightly ochreous.

Expanse 20 millim.

Seventeen specimens, April 16th, 1872, on Currant Creek, an affluent of John Day's River, North Oregon.

### Genus *PLUTELLA* (Schrank).

#### *PLUTELLA CRUCIFERARUM*, Zell. (Wocke, 1626).

This species has been frequently recorded under various names as occurring in North America (see Chambers, Index to described Tineina of United States and Canada, Bull. U.S. Geol. and Geog. Survey, 1878, p. 161), as it does also in Europe, Asia, and Africa. I met with it on Mount Shasta, California, in August 1871; but I have no recollection of having found it in the same abundance there as in Europe. My list includes nine specimens.

It is probably the insect referred to by the Editors of the American Naturalist (vol. v. p. 194) under the name of *Tinea spilotella*, which should be added to Mr. Chambers's list of synonyms.

#### *PLUTELLA INTERRUPTA*, sp. nov. (Plate XXXV. fig. 4.)

*Capite et thorace albidis; antennis albidis, griseo-fusco annulatis et bicinctis; palpis tenuibus albidis; alis anticis subochraceo-albis, dilute griseo-fuscis, ultra medium sublaturis et in toto margine punctatis, macula parva costali ultra medium griseo-fusca, vitta elongata in plica sub medio cellulae late interrupta fusca; posticis cum ciliis griseis.*

Head and thorax white; palpi rather slender, white, the second joint touched with greyish fuscous above. Antennae white, annulated with greyish fuscous, and having two rather wide but inconspicuous rings of greyish fuscous, the first about their middle, the second beyond it.

Fore wings rather yellowish white, very slightly shaded or mottled with pale greyish fuscous, especially beyond the middle; a pale greyish fuscous spot on the costa, at about one third from the apex; the costal, apical, and dorsal margins dotted with greyish fuscous; on the fold is a dark fuscous streak, commencing below the costa near the base, widely interrupted below the middle of the cell, the first portion slightly curved and more than twice as long as the second: hind wings and their cilia grey. Underside greyish fuscous.

Expanse 19 millim.

This is evidently the North-American representative of the European *Plutella annulatella* (Curtis), which it greatly resembles. It differs in the ground-colour of the fore wings being yellowish white

instead of greyish ochreous or "greyish brown," as stated in Mr. Stainton's Manual; but it possesses the same characteristic markings, rendered more conspicuous by the paler ground-colour, but more curtailed and divided; the two rings on the antennæ appear in both species, although, curiously, they are not mentioned by Mr. Stainton either in his 'Insecta Britannica' (Tineina) or in the Manual. The dark shading, which in English specimens covers the whole upper half of the fore wings, is scarcely traceable in the single specimen now before me, which occurred in Southern Oregon at the beginning of May 1871.

*PLUTELLA ALBIDORSELLA*, sp. nov. (Plate XXXV. fig. 5.)

*Capite albo; palpis albis, ad latera brunneo-fusco attinctis; antennis subannulatis, apicem versus bimaculatis; thorace albo; alis anticis albis, litura brunneo-fusca, infra biangulata, ultra medium oblique porrecta, plus quam dimidium costale obtegit, punctis nonnullis in margine apicali et maculis in spatio apicali brunneo-fuscis, ciliis albidis brunneo-fusco interruptis; posticis subcinereis.*

Head white; palpi white, the tuft upon the second joint tinged on the outside with brownish fuscous. Antennæ white at the base, faintly annulated beyond it, with two brownish fuscous spots towards the apex, the first occupying about three joints, the second (nearest to the apex) occupying two. Thorax white. Patagia brownish fuscous at their base, white beyond.

Fore wings white, with a large brownish fuscous costal blotch extending over more than half the wing, having two angles at its lower edge, the outer one of which is the most clearly defined, terminated obliquely beyond the middle. There are a few brownish fuscous dots on the dorsal margin, and some small brownish fuscous blotches on the apical portion of the wing, the whitish cilia being also interrupted by brownish-fuscous spots and streaks.

Hind wings pale cinereous.

Expanse 15 millim.

A single ♂ specimen of this very distinct species occurred in Lake county, California, June 18, 1880.

*PLUTELLA PORRECTELLA*, Linn. (Wocke, 1624).

This species occurred May 31, 1872, in Mendocino county, in August on Mount Shasta, California, and in June in Southern Oregon, but very sparingly: I met with only about six specimens in all. It was first noticed in America by Dr. Clemens, who described it under the name *Plutella vigiaciella*, teste Stainton (Tin. N. Amer. p. 90).

*PLUTELLA VANELLA*, sp. nov. (Plate XXXV. fig. 6.)

*Capite et palpis albidis; antennis annulatis; alis anticis albidis brunneo atomosis, fascia basali triangulari obliqua et plaga media triangulari (in costa macula albida interrupta) brunneis, margine apicali brunneo, anguste adumbrato; posticis cinereis, ciliis paulo dilutioribus.*

Head and palpi whitish, the latter having the tuft on the second joint about the same length as the apical joint. Antennæ annulated with brown and whitish.

Fore wings whitish, dusted with brownish scales, with a brown triangular basal fascia tending obliquely outward from the costa, where it is very wide, and reaches the base of the wing to beyond the first third of the dorsal margin, where it is very narrow. Beyond this, after a conspicuous oblique fascia of the pale ground-colour, is a large brown V-shaped blotch enclosing a whitish triangular costal spot occupying about the middle of the costa; the apical margin is somewhat narrowly shaded with brown; and the whitish cilia are touched with brown, especially towards the anal angle.

Hind wings cinereous, the fringes scarcely paler.

Expanse 16 millim.

May 19, near San Francisco; June 16–22, Lake county; July 15, Shasta county, California.

A single specimen of what I suppose to be a variety of this species occurred on the coast towards the north of California in June 1872. In it the whitish ground-colour of the fore wings is entirely suffused with brown, and the markings, although in exactly the same position as in the normal form, are almost obscured.

The species is much larger than *Plutella hufnagelii*, Zell., and differs in its markings, but is evidently allied to it.

### Genus CEROSTOMA (Latreille).

The only species, among those described by American authors, which has been placed in this genus up to the present time is *Cerostoma brassicella* (Fitch), which is the well-known cosmopolitan *Plutella cruciferarum* (Zell.), as pointed out by Mr. Stainton (Tr. N. Amer. p. 90), also subsequently by Prof. Zeller (Verh. z.-b. Ges. Wien, 1873, p. 33), and by Mr. Chambers. Mr. Chambers, in his Index to the Tineina of the United States and Canada (Bull. U.S. Geog. & Geol. Surv. vol. iv. no. 1, p. 134), omits to notice that Mr. Walker (Cat. Lep. Het. B. M. xxviii. p. 546) records the occurrence in Hudson's Bay of *Cerostoma xylostella* (Linn.) (*dentella*, Fabr., Staud. and Wocke Cat. 1652). I have searched for the specimen in the British Museum, and am unable to find it. It is not improbable that one of the allied species, hereinafter described, may have been under Mr. Walker's notice. There is scarcely sufficient evidence, in the absence of the specimen referred to, to establish the occurrence of *Cerostoma xylostella* (Linn.) in America.

Among the numerous Tineidæ which I have received from the Eastern States the genus *Cerostoma* has been conspicuously absent, affording an additional illustration of the divergence of their Lepidopterous fauna from those of California and Oregon.

### CEROSTOMA INSTABILELLA, Mann.

I am indebted to Mr. Stainton for a specimen of this species, which I have carefully compared with nine examples taken on Mount Shasta,

California, in August 1871. I can detect no appreciable difference between the American and the European forms.

The absence of any defined anal angle in the fore wings, although the cilia somewhat replace it in appearance, will at once enable *C. instabilella* to be distinguished from the following new species (*C. falciferella*, Wlsm.).

*CEROSTOMA FALCIFERELLA*, sp. nov. (Plate XXXV. fig. 7.)

*Capite cum palpis griseo atomosis; alis anticis angustis, quam latioribus quadruplo longioribus, margine apicali falciformi, fulvo-griseis, fasciis duabus a margine dorsali obliquis subobsoletis; posticis dilute cinereis.*

Head speckled grey; the tufted palpi projecting more than twice the length of the head beyond it, speckled grey.

Fore wings narrow, fully four times as long as wide, the apex extremely falcate, the anal angle well defined, its projecting cilia giving a falciform appearance to the apical margin, rusty grey, with a slight tawny shade upon their costal half not extending to the apex. There are two subobsolete slightly darker fasciæ scarcely distinguishable, except towards the dorsal margin, from which they tend obliquely outwards—the one scarcely beyond the middle, the other halfway between this and the base of the wing; and in some specimens is a narrow and rather angulated tawny fuscous streak running from the end of the cell to a point immediately above the apex, and another from the base of the wing below the middle running parallel to the first half of the dorsal margin.

Hind wings and their cilia pale cinereous.

Expanse 25–28 millims.

Twelve specimens, Mount Shasta, California, August 1871; six specimens, Camp Watson, Northern Oregon, beginning of April.

This species is larger than *C. instabilella*, which usually expands about 21 or 22 millims., and is distinguishable from it by the development of the anal angle of the fore wings and by its broader hind wings.

*CEROSTOMA RADIATELLA* (Donovan).

I took seventeen specimens of this species at Camp Watson in Northern Oregon, which exhibit an equal range of variation to that which is attained by the same species in Europe. They occurred in April 1872, probably after hibernation; but for the most part they are in good condition.

*CEROSTOMA CERVELLA*, sp. nov. (Plate XXXV. fig. 8.)

*Capite dilute cervino, ore et palpis supra pallidioribus; antennis albo et fusco annulatis; alis anticis costa arcuata apice non falcata, cum ciliis, subpurpurascanti-cervinis, striga diffusa purpureo-fusca a tergo basali usque ad apicem divisis, maculis duabus in margine dorsali purpureo-fuscis, prima apud angulum basalem, secunda paulo post medium; posticis dilute fulvido-griseis, ciliis paulo pallidioribus; abdomine supra cinereo, infra albido.*

Head pale fawn-colour, the face somewhat paler. Palpi fawn-colour at the sides and beneath, paler above. Antennæ annulated with whitish and fuscous.

Fore wings with the costa arched, the apex not falcate, together with their cilia pale fawn-colour, more or less suffused or sprinkled with purplish, having a purplish fuscous diffused streak running from before the middle to the apex, dividing the apical half of the wing into two nearly equal parts. There are two purplish fuscous spots on the dorsal margin, the first at the rather conspicuous angle near the base, the second scarcely beyond the middle. The cilia at the anal angle are very long, giving the whole wing a falcate appearance.

Hind wings pale fulvous grey, the cilia somewhat paler.

Abdomen above pale cinereous, beneath (together with the legs) whitish.

760. Expanse 20 millim.

I have two specimens of this species—one reared from a cocoon found on the trunk of an evergreen oak, May 18, near San Francisco, the other from a cocoon found on June 14, on a leaf of *Helianthus bolanderi* (Gray), in Mendocino county, California. The first emerged on May 31, the second on June 27, 1871. It is allied to *Cerostoma parenthesella*, Linn. (*costella*, Fabr.), Wocke, 1641.

*CEROSTOMA SUBLUCELLA*, sp. nov. (Plate XXXV. fig. 9.)

*Capite albo; antennis albo et fusco annulatis; thorace cuneum album gerente; alis anticis costa arcuata, apice subfalcato, subfulvo-cervinis, ciliis et patagiis unicoloribus; posticis cum ciliis cinereo-albidis, margine paulo adumbrato.*

Head white; palpi white above, fawn-colour at the sides and beneath. Antennæ annulated with white and fuscous. Thorax with a white wedge-shaped mark pointing backwards from the head.

Fore wings with the costa slightly arched, the apex subfalcate, fawn-colour with a slight tawny gloss; the patagia and cilia are of the same colour. The hind wings and their cilia are dirty whitish, slightly tinged with cinereous along their margins and at the base of the cilia.

Expanse 15–17 millim.

Three males, two females.

Mendocino and Lake counties, June 10 to 17, and Shasta county, California, July 19, 1871.

This species belongs to the same group as *C. sylvella* (Linn.), *C. alpella* (Schiff.), and *C. lucella* (Fab.). It is most nearly allied to the latter, differing from it in the white wedge-shaped thoracic mark, in the darker fawn-colour of the fore wings, which are also of a more uniform width, not attenuated towards the base as in the European species, and in the much paler hind wings.

*CEROSTOMA DENTIFERELLA*, sp. nov. (Plate XXXV. fig. 10.)

*Capite, thorace et palpis (supra) stramineo-albidis; antennis annulatis; patagiis dilute castaneis. Alis anticis a basi ad apicem purpurascenti-brunneo suffusis; costæ basi, margine*



*dorsali, dente obliquo ultra medium supra projecto, et margine apicali cum ciliis, dilute croceis: posticis stramineo-albidis.*

Head, palpi, and thorax yellowish white, the sides of the palpi and the patagia touched with pale reddish brown; antennæ annulated.

Fore wings pale canary-yellow suffused with bright purplish brown, except at the costal portion of the base and along the dorsal two thirds of the wing; the apical margin and cilia beneath the falcate apex also maintain the pale ground-colour, and the dark portion of the wing is incised on its lower edge beyond the middle by an oblique tooth-shaped projection from the pale dorsal space.

Hind wings and cilia straw-white.

Abdomen and legs whitish grey.

Expanse 20-22 millim.

Mount Shasta, California, August 1871.

This and the two following species belong to the group of which *C. dentella*, Fab. (*xylotella*, Linn.), No. 1652 of Wocke's Cat., is the type, and are nearly allied to that species.

*CEROSTOMA CANARIELLA*, sp. nov. (Plate XXXV. fig. 11.)

*Antennis annulatis; palpis, capite, thorace et alis anticis dilute croceis, labe subangulata apud medium et ciliis ad apicem falcatum subcastaneis; alis posticis cum ciliis stramineo-albidis.*

Antennæ annulated with yellowish white and chestnut-brown. Palpi pale yellowish, slightly tinged with brown at the sides, projecting nearly three times the length of the head beyond it. Head, thorax, and fore wings pale canary-yellow; the fore wings strongly falcate at the apex, having a subangulate and rather diffused pale chestnut-brown blotch on the cell about the middle, often with a few blackish scales about the angle on the middle of its lower edge; in good fresh specimens a few single pale chestnut-brown scales are thinly scattered over the surface of the pale ground-colour; cilia yellow, tinged at the tips with brownish, especially at the extreme apex. Abdomen, hind wings, and cilia straw-white.

Expanse 19-21 millim.

Scott's Valley, Lake county, May 18, 1871.

Several specimens flying among *Symphoricarpus mollis* (Nuttal).

*CEROSTOMA FRUSTELLA*, sp. nov. (Plate XXXV. fig. 12.)

*Antennis annulatis; capite stramineo; palpis externe brunneis, interne albido-stramineis; alis anticis croceo-flavidis, rufo-brunneo suffusis et partim lineatis (excepto margine dorsali dilute croceo); posticis cum ciliis dilutissime griseis.*

Head yellowish above, paler in front; palpi yellowish white above and on their inner sides, tinged with brown outwardly; antennæ annulated; the middle of the thorax whitish, the patagia reddish brown.

Fore wings pale yellow, suffused and partly streaked with reddish brown, except at the base of the costa and along the dorsal third of the wing, which is pale canary-yellow, and is separated from the darker portion of the wing by a whitish streak along the basal half. The brown shading is most conspicuous along the fold, where it ex-

tends in a strong streak from the base to beyond the middle, and is diffused in the form of ill-defined lines upwards and outwards to the middle of the costa and to the apical margin. In some specimens the costa is touched with whitish on its extreme edge before the middle. Cilia reddish brown.

Hind wings and cilia very pale grey.

Expanse 19–21 millim.

Twenty-six specimens, Shasta county, California, July 28, 1871.

#### EUCERATIA, gen. nov.

*Capilli hirsuti. Ocelli nulli. Palpi maxillares nulli. Palpi labiales longe porrecti, hirsute vestiti, articulo secundo supra floccoso, tertio basi incrassato, quam secundus paulo longiore. Antennæ pubescentes, articulis alternis aliquid incrassatis. Alæ antica costa paulum arcuata, amplæ, margine apicali obliquo, angulo anali subconspicuo. Alæ posticæ plenæ, ciliis longis, apice vix acuminato.*

Head and face rough with tufts of long scales projecting forwards and upwards. Ocelli none; maxillary palpi none. Antennæ pubescent, slender; basal joint somewhat enlarged, the alternate joints slightly thickened by groups of appressed scales above. Palpi straight, projecting three times the length of the head in front, hirsute, with the first joint small; second scarcely thickened, tufted, especially on its upperside, with long bristling scales projecting forwards; third rather longer and slightly more slender than the second, enlarged at the extreme base, also roughly clothed, having a tendency to turn outwards as in *Topeutis* (Zeller).

Fore wings ample, with the costa slightly arched, the apical margin oblique, the apex extended, and the anal angle not well defined.

EUCERATIA CASTELLA, sp. nov. (Plate XXXV. fig. 13, 13a, 3b, 13c, 13d.)

*Capite et thorace albis; antennis albis, fusco supra maculatis; palpis porrectis, hirsutis, albis, fusco adspersis; alis anticis albis, squamis brunneo-fuscis sparse irroratis, ciliis albis fusco terminatis; alis posticis dilute brunneo-fuscis, ante medium albidis, ciliis albis; anticis infra albidis dilute brunneo-fuscis, albo marginatis; posticis infra albidis paulo fusciscentibus.*

Head, face, and thorax white. Antennæ pubescent, white, conspicuously dotted above with brownish fuscous beyond the base, tinged with brownish fuscous beneath. Palpi projecting nearly three times the length of the head beyond it, with the first joint small, second joint scarcely thickened, tufted; apical joint of even size, slightly longer than the second, white, clothed with long coarse scales, most of which, especially at the sides and beneath, are tipped with brownish fuscous, the tuft on the second joint and the apical joint itself having a tendency to turn outwards as in the genus *Topeutis*, Zell.

Fore wings white, sparsely irrorated with distinct brownish fuscous scales; cilia white, tipped with brownish fuscous. Hind wings white at the base and about the abdominal margin, shading off into

pale brownish fuscous, which covers more than their apical half; cilia white, with a slight brownish fuscous line towards their base around the apex. Underside of fore wings brownish fuscous, with all the margins white; underside of hind wings white tinged with brownish fuscous.

Legs and abdomen yellowish white.

Expanse 17-21 millim.

Several specimens near San Francisco and on Mount Shasta, May and August, 1871.

*EUCERATIA SECURELLA*, sp. nov. (Plate XXXV. fig. 14.)

*Capite et palpis hirsutis, griseo-albidis; antennis annulatis; alis anticis a basi dilatatis (costa post medium arcuata, margine apicali concavo), griseo-albidis, brunneo-fusco dilute suffusis vel lituratis, striga ultra medium plicæ oblique transversa fusca, striga angulata diffusa apud finem cellule postice subfusco marginata, litura costali post medium subconspicua, ciliis brunneo-fusco et albido alternantibus; alis posticis saturate albido-griseis.*

Head and palpi very roughly clothed, greyish white above, brownish beneath; antennæ annulated; thorax greyish white.

Fore wings greyish white, shaded and sometimes blotched with greyish and brownish fuscous, narrow at the base, expanding outwardly, rather hatchet-shaped, having the costa somewhat arched beyond the middle, the apical margin slightly concave. The species is somewhat variable. In some specimens the most conspicuous markings are an oblique detached transverse fuscous streak crossing beyond the middle of the fold (in one example this streak is divided into two spots), a pale whitish angulated streak at the posterior angle of the cell, deflected and diffused outwardly towards the anal angle, and a brownish fuscous, more or less conspicuous blotch slightly beyond the middle of the costa; in others this blotch is extended and reduplicated towards the apical portion of the wing, giving it an obliquely bifasciated appearance. The cilia are chequered with alternate white and brownish or greyish fuscous spots, extending round the apex. Underside unicolorous greyish fuscous, with chequered cilia.

Hind wings pale whitish grey, the extreme margin faintly shaded; underside pale whitish grey.

Expanse 25 millim.

Seventeen specimens, taken in Sonoma county, California, late in May 1871.

It is larger than the preceding species, and has the apical margin slightly more concave; but in the antennæ and palpi, as well as in their general structure, they are very similar.

#### Genus *DEPRESSARIA* (Haw.).

Mr. Chambers, in his List of described Tineina of the United States and Canada, in the Bulletin U.S. Geol. and Geogr. Surv. (vol. ix. 1878), enumerates twenty-seven species originally supposed to belong to this

genus. Of these, eleven species described by Mr. Chambers have been removed by himself to other genera; and he has suggested that three more of his species should probably also be transferred to *Gelechia*. One species is found to be identical with a known European form, leaving twelve species on the list. To these must be added three others described by Mr. Walker, of which Mr. Chambers makes no mention.

*Depressaria georgiella*, Walk. Cat. Lep. Het. B. M. xxxv. p. 1827, belongs to the genus *Trichotaphe* (Clem.); but I am unable at present to determine the species. It should more properly be included in the genus *Gelechia* than in *Depressaria*.

*Depressaria clausella*, Walk. Cat. Lep. Het. B. M. xxix. p. 564, is evidently *D. cinereocostella* (Clem.), which is well figured in the Annals of the Lyceum of Nat. Hist. New York, vol. ix. The preface to the volume of Mr. Walker's Catalogue in which his description appears is dated March 7, 1864. The paper in which Dr. Clemens described it was also published at some time during the month of March in the same year. Full references are given by Mr. Chambers to the several published notices of this species, with the exception of that by Mr. Walker.

*Depressaria confertella*, Walk. Cat. Lep. Het. B. M. xxix. p. 563, is a *Cryptolechia*, and is identical with *Cryptolechia tentoriferella*, originally described by Dr. Clemens as *Machimia tentoriferella*, Clem. (Proc. Ac. Nat. Sci. Phil. 1860, p. 212). It has also since been described by Mr. Chambers under the name *Depressaria fernaldella*, which is contained in his list of the genus. I am assured by Prof. Fernald that he is well acquainted with the species, and that it agrees with a specimen of the true *C. tentoriferella* which I received from him for comparison with Mr. Walker's *D. confertella*; but I am aware that Mr. Chambers himself (U.S. Geol. and Geogr. Surv.) still doubts their identity. Prof. Zeller (Verh. z.-b. Ges. Wien, 1873, p. 40) first pointed out that it should properly be included in the genus *Cryptolechia*. After eliminating this, we have thus eleven unquestioned species of the genus *Depressaria* recorded as occurring in North America:—

<sup>1</sup> <i>D. atrodorsella</i> , Clem.	<sup>2</sup> <i>D. hilarella</i> , Zell.
{ <sup>1</sup> <i>D. cinereocostella</i> , Clem.	<sup>1</sup> <i>D. lecontella</i> , Clem.
<i>D. clausella</i> , Walk.	<i>D. nebulosa</i> , Zell.
<sup>2</sup> <i>D. eupatoriella</i> , Cham.	<sup>1</sup> <i>D. pulvipumella</i> , Clem.
<sup>1</sup> <i>D. gratella</i> , Robinson.	<i>D. robinella</i> , Packard.
<sup>3</sup> <i>D. heracliana</i> , De G.	<i>D. scabrella</i> , Zell.

Doubtfully referred to *Gelechia* by Mr. Chambers (Bull. U.S. Geol. and Geogr. Surv. Vol. p. 138):—

<i>D.?</i> <i>pallidochrella</i> , Cham.	<i>D.?</i> <i>versicolorella</i> , Cham.
<i>D.?</i> <i>rileyella</i> , Cham.	

<sup>1</sup> These are figured in the Annals of the Lyceum of Natural History, New York, vol. ix.

<sup>2</sup> Of these I have seen specimens in Mr. Stainton's collection.

<sup>3</sup> Also European.

To these may now be added the following from the Western States:—

DEPRESSARIA SABULELLA, sp. nov. (Plate XXXVI. fig. 1.)

*Capite et palpis (articulo apicali fusco annulato) saturate ochreis; antennis fuscis; alis anticis saturate ochreis, costæ basi fusca, punctis quatuor disci fuscis quorum duobus anticis amplius diversis minoribus, nebula subconspicua interjacente fusca; posticis dilute griseo-ochraceis.*

Head and thorax very pale ochreous; palpi the same, but with a slight fuscous annulation on the apical joint, which is also slightly tipped with fuscous; antennæ fuscous.

Fore wings very pale ochreous, with the base of the costa fuscous; four small fuscous discal spots, of which the two upper ones are further apart and less conspicuous than the two lower ones, which are also both situated nearer to the middle of the wing; between the two upper dots is an inconspicuous fuscous shade; some diffused inconspicuous fuscous spots around the apical margin, as well as on the hind margin of the pale greyish ochreous and rather shining hind wings. Cilia of hind wings very pale.

Expanse 24 millim.

One specimen, in Mendocino county, California, June 12, 1871.

This species is allied to *Depressaria subpropinquella* (Stn.), which is of a generally darker hue, and lacks the two outer dots and the fuscous base to the costa. It differs from *Depressaria nanatella*, Stn., also in the number of its discal dots, and in the less mottled appearance of the fore wings.

In a single specimen taken on Mt. Shasta in August, the wings are shorter, the discal spots and the fuscous base to the costa are entirely absent, the costa is mottled, the apical margin immaculate; moreover the cilia of the fore wings are slightly rosy, the cilia of the hind wings being pale yellowish. I am disposed to regard it as a distinct species.

DEPRESSARIA ARGILLACEA, sp. nov. (Plate XXXVI. fig. 2.)

*Capite, palpis et antennis dilute griseo-ochreis; alis anticis dilute griseo-ochreis, fusco atomosis, plaga basali diluta in margine costali diffusa, postice fusco marginata, punctis duobus discalibus ante medium fuscis, puncto ad finem cellulæ subalbido, nebula fusca mediana antice apposita; posticis saturate argillaceis.*

Head, palpi, antennæ, and thorax pale greyish ochreous, the face slightly paler.

Fore wings pale greyish ochreous (a cold stone- or clay-colour), irrorated with blackish fuscous scales; the pale basal patch is diffused along the costal margin, but bounded below it by an outwardly diffused but inwardly distinct blackish fuscous shade; before the middle are two fuscous dots, sometimes containing some brownish scales placed obliquely, the upper one being nearest to the base; these are followed by a blackish fuscous cloud above the middle of

the wing, which reaches to a pale dirty-whitish dot immediately beyond and below it, situated about the end of the cell, and surrounded by some brownish scales. In some specimens is a faint indication of a second pale discal dot preceding it; and in others the two fuscous dots are almost obsolete.

Hind wings very pale greyish ochreous; cilia of the same colour as the wings.

Expanse 21 millim.

The species occurred at Newville, Tehama county, California, July 5, 1871, and in the neighbourhood of Fort Klamath, in Oregon, at the end of September, also at Old Fort Watson, in Northern Oregon, in April of the following year, but was not abundant.

It approaches *D. ocellana* (Fab.) and *D. yeatiana* (Fab.), but differs from the latter in colour, and in having the fore wings wider and less rounded at the apex.

DEPRESSARIA ARNICELLA, sp. nov. (Plate XXXVI. fig. 3.)

*Capite subochraceo; palpis subochraceis, articulo apicali annulato; antennis fusciscentibus; alis anticis saturate ochreis, fusco dilute sublitturatis, punctis tribus discalibus et nebula subconspicua fusciscentibus, costa et margine apicali fusco punctatis, ciliis rufescentibus; alis posticis griseo-sericeis, ciliis rufescentibus.*

Head and palpi greyish ochreous, the apical joint of the palpi annulated with fuscous; antennæ greyish fuscous.

Fore wings pale ochreous, more or less suffused and blotched with greyish fuscous; three rather fuscous discal dots, two about the basal third of the wing, of which the upper one is nearer to the base than the lower, and one towards the end of the cell; between them lies a slight greyish fuscous cloud, sometimes reaching to the costa; the pale basal patch is not very clearly defined, but extends above the cell along the basal third of the costa; the costal and apical margins diffusely dotted with greyish fuscous. Cilia rosy reddish.

Hind wings shining grey, with rosy reddish cilia.

Expanse 22 millim.

Five specimens, bred from larvæ feeding on *Arnica angustifolia* (Vahl), on Mount Shasta, California, August 1871. Allied to *Depressaria adpersella* (Kollar), but without the distinct black costal dots of that species.

DEPRESSARIA KLAMATHIANA, sp. nov. (Plate XXXVI. fig. 4.)

*Capite griseo; palpis griseis, articulo apicali fusco annulato; thorace griseo; alis anticis rufo-griseis, plaga basali ad medium costæ antice producta albo-grisea, postice subrufo marginata, punctis duobus discalibus nigris erectis et punctulo albedo apud finem cellulæ, ciliis rufescentibus; posticis albido-griseis, ciliis dilute rufescentibus.*

Head grey; palpi grey, annulated on the apical joint with fuscous; antennæ pale reddish grey.

Fore wings reddish grey, with a whitish grey basal patch pro-

longed on the costal third nearly to the middle of the wing, distinctly margined beneath it by a strong reddish shade, outwardly diffused and blended with the paler (more greyish) apical half of the wing; the costa slightly speckled with reddish grey; two blackish discal spots of raised scales scarcely beyond the basal third, the lower one being the furthest from the base and slightly elongate; beyond these, about the end of the cell, is a whitish dot, surrounded by a few fuscous scales, sometimes preceded by a similar but even less conspicuous dot on the cell; some fuscous scales are distributed around the apical margin. Cilia dull reddish.

Hind wings whitish grey, with rather rosy cilia.

Expanse 21 millim.

Five specimens taken near Fort Klamath, in Oregon, in the autumn of 1871. One only is in good condition.

This species appears to be allied to *Depressaria ciniflonella* (Zeller), to which it bears some resemblance; but it is less mottled, and has more red about it; moreover the fore wings are less attenuated and elongate.

DEPRESSARIA POSTICELLA, sp. nov. (Plate XXXVI. fig. 5.)

*Capite et thorace subochraceis; palpis concoloribus, articulo secundo externe fusco adperso; antennis fuscis; alis anticis subochraceis, rufo paulum suffusis, fusco irroratis, puncto disci ante medium fusco, punctis marginalibus diffusis fuscis, nebula ante angulum analem (disci dimidium costale nunquam attingente) fusca, ciliis subfuscis (aliquando subroseis).*

Head and thorax rather dull ochreous; palpi of the same colour, sprinkled externally on the second joint with fuscous; antennæ fuscous.

Fore wings rather dull ochreous, sprinkled with fuscous scales, and somewhat suffused with a reddish tinge in some specimens, with a small fuscous spot at the base of the costa; a fuscous dot on the cell before the middle, some diffused fuscous dots along the apical margin, and a fuscous cloud or blotch before the anal angle, reaching from the dorsal margin nearly to the middle of the wing, but not attaining the costal half. Cilia with a fuscous or a rosy tinge in different specimens.

Hind wings greyish; the cilia rosy; the anal tuft sometimes rosy. Expanse 18-21 millim.

I met with this species in Lake county, California, on June 15 and June 30, 1871, and in Southern Oregon in May 1872. I also bred a specimen from among larvæ, feeding together with those of another species of *Depressaria* (*psoraliella*) on *Psoralea physodes* (Dougl.), the larva being found in Mendocino county on May 24, the perfect insect appearing on June 13. I am indebted to the kindness of Prof. Henry N. Bolander, of San Francisco, for the determination of this and other plants mentioned in this paper.

The species differs from *Depressaria angelicella*, Hüb. (Staud. & Wocke, Cat. n. 1736), in the absence of a dot on the fold, and in the

position of the fuscous cloud or blotch, which in that species is situated about halfway between the costal and dorsal margins.

**DEPRESSARIA NUBIFERELLA, sp. nov.** (Plate XXXVI. fig. 6.)

*Capite et thorace ochreis; palpis ochreis, macula parva rufo-brunnea sub articulo apicali; antennis rufo-brunneis; alis anticis ochreis, ultra plagam basalem rufo-brunneo suffusis, litura ultra medium costam nec marginem dorsalem attingente subobliqua rufo-brunnea, margine apicali rufo-brunneo, costa maculata; alis posticis dilute fusco-griseis.*

Head and thorax ochreous, sometimes with a slight reddish tinge; palpi ochreous, recurved, reaching over the vertex, a small reddish spot on the underside near the end of the acuminate apical joint; antennæ reddish brown.

Fore wings ochreous, more or less suffused (beyond the pale basal patch, which does not reach to the costa) with brownish red, which forms a conspicuous darkly centred shade about the end of the cell, reaching to the costa but not to the dorsal margin. This colour is also conspicuous in a number of small spots along the costa, and in a line which runs round the apex, along the apical margin, to the anal angle; the ochreous cilia are more or less shaded with the same colour, especially at their tips; and in some specimens is an indication of two small discal dots situated before the dark central shade, and rather above the middle of the wing, the upper one being nearer to the base than the lower.

Hind wings pale greyish, sometimes with a very faint reddish tinge. Abdomen about the same colour as the fore wings.

In some specimens the reddish tint suffused over the fore wings is replaced by a browner hue, rendering the pale ochreous ground-colour more conspicuous.

Two specimens bred in June from larvæ found feeding on a species of *Hypericum*, Rouge River, Oregon, May 22, 1872; others were taken in Mendocino and Shasta counties, California, in June and July 1871.

This species appears to be somewhat allied to *D. astrantiæ* (Hein.), but differs from it in the dark central shade being somewhat less oblique than in that species, in the pale thorax not being conspicuously shaded with brown, and in the absence of the white discal dots and distinct dark marginal dots which distinguish that species.

**DEPRESSARIA CILIELLA (Stn.)**

This species occurred in North Oregon in April 1872. I met with three specimens only. The commoner European form *D. ap-planata* (Fab.), of which it is sometimes supposed to be merely a variety, was conspicuously absent, nor have I met with it in any American collection.

**DEPRESSARIA YEATIANA (Fab.).**

I took a single specimen towards the end of September 1871, near



Fort Klamath, Oregon. I have also received the species from Mr. Belfrage, from Texas, taken at the beginning of August.

DEPRESSARIA NERVOSA (Haw.).

Two specimens, undistinguishable from English examples of this species, occurred in Southern Oregon at the beginning of May 1872.

DEPRESSARIA PSORALIELLA, sp. nov. (Plate XXXVI. fig. 7.)

*Capite sordide griseo; palpis subrufescenti-griseis, articulo apicali annulato; antennis fusco-griseis; thorace griseo; alis anticis basi grisea, rufo-brunneis, griseo et nigro (præcipue costam versus) atomosis, punctulis duobus vel tribus disci subobsoletis; posticis subfusco-griseis, ciliis rufescentibus.*

Head dull greyish, sometimes sprinkled with reddish; palpi greyish above, reddish beneath, the apical joint annulated; antennæ greyish fuscous. Thorax grey, slightly tinged with reddish immediately behind the head.

Fore wings reddish brown, sprinkled with greyish and blackish fuscous atoms, especially towards the costa; the basal patch somewhat clearly defined, grey, extending slightly outwards towards the costa, containing no dark spot on the dorsal margin as in the allied species *D. cnicella*, Tr. A series of three inconspicuous whitish dots along the cell are sometimes almost entirely obsolete, the first and last only being slightly visible in two of my bred specimens. Cilia reddish.

Hind wings rather fuscous grey, with reddish cilia.

Expanse 20–24 millim.

Four specimens bred from larvæ found drawing together the terminal shoots of *Psoralia physodes* (Dougl.), May 21, Sonoma county, California; the perfect insects emerged June 5 to 8. Allied to *D. hepatariella*, Zell., and *D. cnicella*, Tr.

DEPRESSARIA PARILELLA (Treitschke).

A single specimen from the Eastern States (locality uncertain) agrees fairly well with the description of this species. I have compared it not only with the figures given by Herrich-Schäffer and by Duponchel, but also with some European examples in the British Museum.

It differs from these in having the pale head, thorax, and basal patch less clearly distinguishable from the main colour of the wing, in the discal spots being almost obsolete, and in the cilia being unicolorous with the fore wings.

From the Western States I have other specimens, one of which, taken in California in the summer of 1871, has the pale head, thorax, and basal patch as clearly defined as in the European *parilella*; moreover the pale discal spot is visible although inconspicuous; but the colour of the fore wings is much darker, and may be described as

dull purplish fuscous rather than yellowish brown; the palpi also are much mottled and faintly annulated with purplish fuscous.

Other specimens, taken in Northern Oregon in 1872, have the pale head, thorax, and basal patch much obscured by the purplish fuscous hue of the fore wings, and the pale discal spot obsolete; but these have probably lost some of their brilliancy during hibernation.

In all these the two blackish spots before the middle and the blackish speckling beyond it are clearly distinguishable. On the whole it is doubtful whether the species should or should not be regarded as distinct from its European representative. I have no doubt that the eastern and western American examples are mere local forms of the same insect, although the ground-colour of the fore wings of the specimen from the east accords much more nearly with that of the true *Depressaria parilella*.

If an investigation of its habits should lead to the conclusion that the American form is a distinct species, I would propose for it the name *Depressaria novi-mundi*.

#### DEPRESSARIA EMERITELLA (Stn.).

I bred four specimens of this rather rare European *Depressaria* from larvæ found feeding on leaves of what may have been a species of *Tanacetum*, in May 1872, on Rouge river, in Southern Oregon. I cannot find that I have preserved any specimen of the food-plant; but in my notes it is recorded as an *Artemisia*.

The specimens agree to the most minute particular with Mr. Stainton's description of this species.

#### DEPRESSARIA UMBRATICOSTELLA, sp. nov. (Plate XXXVI. fig. 8.)

*Capite et palpis sordide ochraceis; antennis fuscis; thorace nigro-fusco; alis anticis sordide ochreis, macula basali, punctulis duobus disci, punctis costalibus et marginalibus diffusis et nebula costæ mediæ nigro-fuscis, margine apicali late subfusco adumbrato, ciliis fuscescentibus; posticis griseo-sericeis.*

Head and palpi dull ochreous, the latter dusted with fuscous; antennæ fuscous. Thorax blackish fuscous.

Fore wings dull ochreous, slightly paler than the head, with a short, blackish fuscous basal patch, wider on the dorsal than on the costal margin; several minute, diffused, blackish fuscous spots along the costal and apical margins; a conspicuous outwardly diffused blackish fuscous shade on the middle of the costa, preceded by two minute discal dots of the same colour, of which the upper one is nearer to the base than the lower, and a more or less conspicuous wide subfuscous shade around the apical margin, reaching from the costal patch to the middle of the dorsal margin. Cilia subfuscous.

Hind wings rather shining greyish.

Expanse 16-19 millim.

Taken on Mount Shasta, California, in August 1871, and in Northern Oregon in April 1872, where it was not uncommon. It

has somewhat the same fashion of ornamentation as *Depressaria atrodorsella*, Clem.; but it is a much smaller insect, with narrower wings, more rounded at the apex and anal angle, and with the costal blotch situated nearer to the base.

### Genus MENESTA (Clemens).

*MENESTA TORTRICIFORMELLA*, Clem. Proc. Acad. Nat. Sci. Phil. 1860, p. 213; Stn., Tin. Nor. Am. p. 151.

*Menestra tortriciformella*, Cham., Bull. U.S. Geog. & Geol. Surv. vol. iv. p. 157.

*Gelechia liturella*, Walk., Cat. Lep. Het. B. M. xxix. p. 591.

This is evidently the species described by Mr. Walker as *Gelechia liturella*. His type, which is in the British Museum, is in sufficiently good condition to be easily identified. It agrees with others verified by comparison with what I believe to have been Dr. Clemens's typical specimen in the collection of the American Entomological Society at Philadelphia.

### *MENESTA RUBESCENS*, sp. nov. (Plate XXXVI. fig. 9.)

*Capite, thorace et antennis dilute subochraceo-cinereis; palpis diversis, subulbidis, articulo apicali brunneo-fusco adumbrato, acuminato; alis anticis a basi dilute subochraceo-cinerea rubescentibus, puncto discali subobsoleto fusciscentibus; posticis griseis.*

Head, thorax, and base of the fore wings pale stone-grey; palpi diverging, whitish, the apical joint shaded with brownish fuscous, the tongue scaled with brownish fuscous at the base.

Fore wings shaded off from the pale stone-grey base into pale brick-reddish, becoming almost purplish red before the apical margin; a faint indication of a small subfuscous spot at the end of the cell.

Hind wings greyish.

Expanse 11 millim.

A single specimen received from Mr. Belfrage, from Texas, labelled "August 16."

### Genus GLYPHIPTERYX (Hübner).

### *GLYPHIPTERYX REGALIS*, sp. nov. (Plate XXXVI. fig. 10.)

*Capite, palpis et antennis griseo-sericeis; alis anticis aurantiacis, plaga dorsi basis, striga basali a costa obliqua, fascia antemediana et strigis post medium costalibus tribus nitentibus dilute griseo-chalybeis, ciliis fusciscentibus sub apice albido interruptis, macula elongata supra angulum analem nigra, antice marginem apicalem versus attenuata, punctis quatuor metallice albido-chalybeis ornata, spatium supra eam subochraceo-griseo, strigulis plurimis transversis nigro-fuscis; posticis aurantiaco-brunneis.*

Head small, shining greyish; antennæ greyish, scarcely pubescent; palpi short, slightly upturned, shining greyish above, whiter beneath. Thorax orange, greyish in the middle, whitish beneath.

Fore wings bright orange, with shining steel-grey bands or streaks

and four bright metallic steel-white dots set in an elongate black patch above the anal angle. The first steel-grey streak, which is much dilated towards the base of the costa, reaches obliquely to the outer extremity of a steel-grey patch at the base of the dorsal margin; beyond it, before the middle of the wing, is a narrow, straight, pale steel-grey fascia with rather darkened margins; slightly beyond the middle of the costa is another pale steel-grey mark, expanding immediately below the costa and diffused into a pale greyish ochreous patch, much occupied by slender, transverse, blackish fuscous streaks; beyond this, again, is a bright steel-blue streak, whitish towards the costa, and reaching to a whitish interruption in the fuscous cilia above the middle of the apical margin; a shorter and paler steel-grey streak lies immediately before the apex, but does not quite reach the apical margin. The costa is narrowly shaded with blackish fuscous, especially beyond the middle. The elongate black patch above the anal angle, containing four steel-white metallic dots, stretches from the dorsal margin before the anal angle to near the middle of the apical margin, in which direction it is somewhat attenuated; there are two small black marginal dots below it. Underside with two white costal streaks towards the apex, preceded by two white costal spots, and with a short white streak from the apical margin.

Expanse 17 millim.

This species differs from *Glyphipteryx loricatella* (Tr.), in the more rounded hind wings, which are not indented beyond the abdominal angle, as well as in the absence of brilliant metallic endings to the costal streaks, which, however, are the same in number and position. It differs also in the absence of two white dorsal spots, and in the black patch being narrower and running obliquely instead of parallel to the dorsal margin. The hind wings are paler, and the fore wings a lighter orange-colour than in the European species.

In general appearance it exhibits some approach to some of the *Hydrocampidæ*. The small head and the form of the palpi, as well as the character of the ornamentation, cannot fail to remind us of *Cataclysta* (H.-S.) and some allied Asiatic genera.

I have met with only one specimen, taken on Mount Shasta, California, in August 1871, and slightly denuded at the time of its capture.

GLYPHIPTERYX CALIFORNIAE, sp. nov. (Plate XXXVI. fig. 11.)

*Capite, thorace et antennis ochreo-griseis; palpis griseo-albidis; alis anticis subæneis brunneo suffusis, litura dorsali basis albida, strigis, quinque costalibus, una dorsali, albidis brunneo utrinque marginatis et roseo chalybeo finitis, macula dorsali albida et tribus oblique supra eam dispositis roseo-chalybeis, una supra angulum analem et una sub apice (ciliis albedo interruptis) roseo-chalybeis, ciliis æneo-brunneis albedo terminatis; alis posticis brunneis; tibiis et tarsis posticis brunneis, albedo annulatis.*

Head, thorax, and antennæ yellowish grey; palpi greyish white.

Fore wings æneous, or bronzy yellowish suffused with brown; a partially interrupted oblique whitish blotch from near the base of the dorsal margin joins at its outer extremity a somewhat similar diffused whitish streak arising at the middle of the base, and extending less than one third along the wing; beyond it from the costa is a conspicuous oblique outwardly curved white streak extending to the middle of the wing, sometimes touched with rosy steel-colour at its extreme point and margined with brown on both sides; beyond this, also from the costa, are four shorter whitish streaks, brown-margined and tipped with iridescent rosy steel-colour, the first pair of these streaks being further apart and more oblique than the second pair. On the dorsal margin is an oblique whitish streak situated rather beyond the first costal streak, tipped with rosy steel-colour, and followed by a small whitish dorsal spot before the anal angle; these are also margined with brown on both sides. Above the dorsal spot, where the wing is much suffused with brown, are three iridescent rosy steel-coloured roundish spots distributed in an outwardly oblique line; there are also two similar spots—one above the anal angle, and one below the apex (where the cilia are interrupted by a narrow whitish streak). Cilia brown at the base, whitish beyond, with a projecting brown streak from the blackish extreme apex, giving a falcate appearance.

Hind wings brown.

Underside brown, with one marginal and two costal white streaks near the apex, and two or three slight whitish costal spots preceding them.

Posterior tibiæ and tarsi brown, annulated with whitish.

Expanse 11 millim.

Taken in Shasta county, California, about the middle of July 1871, and described from a series of ten specimens.

GLYPHIPTERYX BIFASCIATA, sp. nov. (Plate XXXVI. fig. 12.)

*Capite brunneo; antennis dilute brunneis, fusco supra submaculatis; palpis albidis fusco trilineatis; alis anticis subæneo-brunneis, fascia interna basali obliqua, fascia mediana recta et strigulis tribus costalibus post medium albis, serie punctorum chalybeorum quinque vel sex apud angulum analem nigro succinctorum, puncto roseo-chalybeo ciliis sub apice apposito; posticis brunneis.*

Head brownish; antennæ brownish, faintly spotted above with fuscous. Palpi whitish, with three more or less distinct brownish fuscous rings.

The anterior wings bronzy brown, with two white fasciæ, the first tending obliquely outwards towards the costa (in one specimen obliterated before reaching it), the second about the middle, straight; beyond this on the costa are three short, white, slightly oblique streaks, usually tipped with a few rosy metallic scales; the outer streak is the largest, and nearly reaches a rosy steel-coloured metallic spot which joins a whitish streak in the cilia below the apex; around the anal angle is a black elongate marginal patch preceded by two rosy steel-coloured metallic spots one above the other, and contain-

ing four (sometimes three) bright metallic spots, above which the wing is sprinkled with greyish scales. Cilia brown at the base, whitish grey beyond. Underside with some slight costal spots and one costal and one apical streak white.

Hind wings brown; cilia the same.

Expanse 11-13 millim.

Two specimens taken near San Francisco in May, and three near Mount Shasta, California, at the end of July 1871.

GLYPHIPTERYX UNIFASCIATA, sp. nov. (Plate XXXVI. fig. 13.)

*Capite et antennis sordide grisescenti-brunneis; palpis sordide albidis, brunneo maculatis et annulatis; alis anticis brunneis, striga dorsali prope basin externe obliqua, fascia subobliqua ante medium et strigulis ultra medium tribus costalibus et una dorsali albis, serie punctorum quinque chalybeo-metallicis apud angulum analem nigro succinctis, ciliis brunneis albido terminatis, sub apice albido interruptis, macula roseo-chalybea adjacente; posticis brunneis.*

Head and antennæ dull greyish brown; palpi dirty whitish, spotted or annulated with brownish.

Fore wings brown, an outwardly oblique white dorsal streak reaching about halfway across the wing; a slightly oblique white fascia before the middle, tending outwards from the costa to the dorsal margin, followed by four rather straight white costal streaks, of which the first is the longest and reaches nearly to a meeting with an opposite straight white dorsal streak; a series of four shining metallic dots in an elongate black marginal patch near the anal angle, above the first of which is a fifth detached shining metallic spot; below the apex, joining a white streak in the cilia is a rosy metallic spot; some bright rosy metallic scales lie also about the ends of the white costal streaks.

Hind wings brown.

Expanse 10-11 millim.

Two specimens near San Francisco, May 19, 1871. It differs from the preceding species (*G. bifasciata*) in having four instead of three costal streaks on the upperside, and three instead of one on the underside, also in the first fascia extending only half across the wing.

GLYPHIPTERYX QUINQUEFERELLA, sp. nov. (Plate XXXVI. fig. 14.)

*Capite et palpis griseis; antennis griseis, longe ciliatis, interne albido punctatis; alis anticis (apice rotundato, basi flavida) griseo et fusco atomosis, signum numerale Romanum V flavidum, griseo marginatum in medio ferentibus, serie marginali punctorum quatuor nitide chalybeorum apud angulum analem, puncto quoque antice latius nigro circumdato; posticis brunneo-fuscis.*

Head and palpi grey. Antennæ grey, obscurely dotted inwardly with whitish, clothed with rather long cilia.

Fore wings rounded at the apex, with the base yellowish, intersected longitudinally with obscure streaks of greyish scales; beyond the yellowish basal patch is a distinct yellowish  $\nabla$ , universally margined with whitish grey; beyond it the apical half of the wing is whitish grey irrorated with fuscous scales, with a slight yellowish oblique streak immediately before the pale extreme apex; about the anal angle is a series of four distinct, shining, whitish, steel-coloured, metallic marginal dots, each surrounded by a separate deep-black border which is wider above than below them; above the outer spots are some bluish metallic scales at the base of the greyish fuscous cilia; underside unicolorous brownish.

Hind wings brownish fuscous.

Expanse 13 millim.

Eight specimens taken, July 15, 1871, Shasta county, California.

### Genus HELIODINES (Stainton).

HELIODINES EXTRANEELLA, sp. nov. (Plate XXXVI. fig. 15.)

*Alis anticis cupreo-aurantiacis, basi fusca, maculis tribus costalibus una dorsali argenteo-metallicis, maculis duabus triangularibus (una costali ante apicem, altera ante angulum analem) niveis, omnibus partim nigro succinctis, ciliis cupreo-metallicis.*

Head, face, and palpi shining metallic greyish fuscous. Antennæ fuscous.

Fore wings bright reddish orange, with a small fuscous basal patch slightly produced above the fold; three small silvery metallic costal spots followed by a triangular snow-white spot before the apex; one silvery metallic dorsal spot situated very slightly nearer to the base than the first costal spot, from which it is separated only by a few black scales on the fold; it is followed by a triangular snow-white spot before the anal angle; all the spots are more or less surrounded by scattered black scales; the apex and apical margin, with the base of the cilia, shining metallic bronzy cupreous.

Hind wings pale fuscous with slightly darker cilia.

The underside of all the wings shining bronzy, a bright orange spot on each side of the thorax beneath at the base of the fore wings. Third pair of legs with their long spurs shining silvery metallic, the tarsi with three conspicuous black bands.

Expanse 8 millim.

Pitt River, California, July 23, 1871.

This species agrees with the genus *Ætole* of Chambers (Can. Ent. vii. p. 173) in the length of the tongue, as well as in the rather narrowly produced apex of the fore wings, the only points in which it differs in external appearance from the genus in which I have ventured to place it. Mr. Stainton, who founded that genus (Ins. Brit., Lep. Tin. p. 243) for the reception of a single species, *Tinea rosella*, Linn., writes to me that he "should be disposed to refer the insect" of which I sent him a specimen "to *Heliodines*." Without destroying one of my limited number of

examples to examine the neururation, I can find no difference in structure beyond the very slight modification above referred to.

A careful comparison of the descriptions of *Ætole* and *Heliodines* shows them to be at least very closely allied, if not identical; and as Mr. Chambers's figure of the neururation of his *Ætole bella* (Journ. Can. Soc. Nat. Hist. Jan. 1880, p. 26, fig. 54) does not seem to agree precisely with his previous description of the number and position of its veins, there may, perhaps, be some doubt as to the sufficiency of the evidence on which he separates them.

*ÆTOLE*, Chambers  
(Can. Ent. vii. p. 73).

"Scales of the head appressed; forehead wide, obtuse.

"Antennæ simple, rather thick, about as long as the body; basal joint short."

Tongue long and naked.

No maxillary palpi.

"Labial palpi very short, drooping, the third joint pointed.

"The discal gives off two branches, the superior being furcate before the apex, with one of the branches to each margin" (figured simple, not furcate).

*HELIODINES*, Stainton  
(Ins. Brit., Lep. Tin. p. 243).

"Head smooth; forehead obtuse.

"Antennæ setaceous, almost as long as the body; basal joint short, clavate.

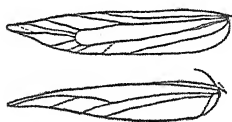
"Tongue of moderate length."

(No maxillary palpi mentioned, none existing.)

"Labial palpi small, rather thick, acuminate.

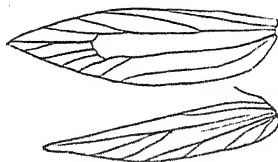
"The furcate apical vein terminates in the apex and in the hinder margin."

Fig. 1.



*Ætole bella*.

Fig. 2.



*Heliodines rasella*.

Neururation of wings.

If the upper fork of the apical vein (apparently described, but omitted in the figure, by Mr. Chambers) be inserted, the neururation of the two genera will be found to correspond very closely, with the exception of the absence of a short vein in *Ætole* which in *Heliodines* runs from the lower edge of the cell to the dorsal margin, which may possibly have been overlooked.

Mr. Chambers places his genus among the Elachistidæ, and states that it "resembles closely the European *Chrysoclista linneella*," which is the British genus placed nearest to *Heliodines* by Mr. Stainton, although not so placed in Wocke's Catalogue.



## EXPLANATION OF THE PLATES.

## PLATE XXXV.

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| <p>Fig. 1, 1a, 1b, 1c. <i>Phryganeopsis brunnea</i>, p. 302.</p> <p>2. <i>Calantica polita</i>, p. 302.</p> <p>3, 3a. <i>Aræolepia subfasciella</i>, p. 303.</p> <p>4. <i>Plutella interrupta</i>, p. 304.</p> <p>5. — <i>albidorsella</i>, p. 305.</p> <p>6. — <i>vanella</i>, p. 305.</p> <p>7. <i>Cerostoma falciferella</i>, p. 307.</p> | <p>Fig. 8. <i>Cerostoma cervella</i>, p. 307.</p> <p>9. — <i>sublucella</i>, p. 308.</p> <p>10. — <i>dentiferella</i>, p. 308.</p> <p>11. — <i>canariella</i>, p. 309.</p> <p>12. — <i>frustella</i>, p. 309.</p> <p>13, 13a, 13b, 13c, 13d. <i>Eucerratia castella</i>, p. 310.</p> <p>14. <i>Eucerratia securella</i>, p. 311.</p> |
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## PLATE XXXVI.

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| <p>Fig. 1. <i>Depressaria sabulella</i>, p. 313.</p> <p>2. — <i>argillacea</i>, p. 313.</p> <p>3. — <i>arnicella</i>, p. 314.</p> <p>4. — <i>klamathiana</i>, p. 314.</p> <p>5. — <i>posticella</i>, p. 315.</p> <p>6. — <i>nubiferella</i>, p. 316.</p> <p>7. — <i>psoralicella</i>, p. 317.</p> <p>8. — <i>umbraticostella</i>, p. 318.</p> | <p>Fig. 9. <i>Menesta rubescens</i>, p. 319.</p> <p>10. <i>Glyphipteryx regalis</i>, p. 319.</p> <p>11. — <i>californica</i>, p. 320.</p> <p>12. — <i>bifasciata</i>, p. 321.</p> <p>13. — <i>unifasciata</i>, p. 322.</p> <p>14. — <i>quinqueferella</i>, p. 322.</p> <p>15. <i>Heliodines extraneella</i>, p. 323.</p> |
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March 1, 1881.

Professor Flower, LL.D., F.R.S., President, in the Chair.

The Secretary exhibited a dead specimen of a large Spider of the genus *Mygale*, which had been presented to the Society's collection alive by Dr. A. Stradling, C.M.Z.S., on March 17, 1880, being the example referred to by Dr. Stradling in a letter published in 'Land and Water' in June 1880 (vol. xxix. p. 510), as also the shed integument of the same Spider. Mr. Butler, having kindly examined the specimen, had referred it, with some doubt, to *Mygale bistriata*, Koch. It had been obtained by Dr. Stradling at Bahia.

In the Gardens the Spider had been kept in a case kept heated with hot water to a temperature of about 75 degrees Fahr., and fed with cockroaches, upon which it appeared to have thriven well<sup>1</sup>. On the 27th August the Spider shed its skin, which process (as witnessed by the Superintendent and Mr. Thomson in a smaller example, probably of the same species) lasted about four hours<sup>2</sup>.

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The following papers were read:—

<sup>1</sup> See Mr. Thomson's letter, 'Land and Water,' vol. xxix. p. 551.

<sup>2</sup> See Mr. Bartlett's description of the process, in 'Land and Water,' Feb. 5, 1881 (vol. xxxi. p. 102).

1. Descriptions of new Genera and Species of Asiatic Nocturnal Lepidoptera. By F. MOORE, F.Z.S.

[Received February 1, 1881.]

(Plates XXXVII., XXXVIII.)

Tribe BOMBYCES.

Fam. CHALCOSHIDÆ.

CHATAMLA, n. g.

*Male and Female.* Fore wing elongated, trigonal, costal margin nearly straight, apex slightly rounded, exterior margin very oblique and slightly convex, posterior margin nearly straight; costal vein extending to two thirds of the wing, first subcostal branch emitted at half length of the cell, second at one fourth before end of the cell, and trifid near the apex, fifth bifid at half its length beyond the cell; cell short; discocellulars slightly concave, the radial starting from their middle; median vein three-branched, second emitted from angle before end of the cell; submedian nearly straight. Hind wing short, broad, anterior margin arched at the base, apex slightly convex, exterior margin convex, angled anteriorly and at the middle, abdominal margin long; costal vein extending to apex, subcostal two-branched, first emitted before end of the cell; cell short; discocellular slightly oblique, radial from near upper end; median three-branched, second from angle before end of the cell; a submedian and a slender internal vein. Body slender, short, squamose; antennæ finely bipectinated; palpi slender, pilose, apex pointed; legs squamose, spurred.

Type *Chatamla flavescens*.

CHATAMLA FLAVESCENS.

*Euschema flavescens*, Walker, Catal. Lep. Het. Brit. Mus. ii. p. 406 (1854); Illustr. Type Spec. Lep. Het. Brit. Mus. part i. p. 57, pl. 14. fig. 3, ♀ (1877).

*Hab.* Khasia Hills.

CHATAMLA NIGRESCENS.

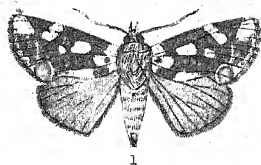
*Euschema nigrescens*, Moore, Deser. Lep. Coll. Atk., As. Soc. Beng. p. 20 (1879).

*Hab.* Darjiling.

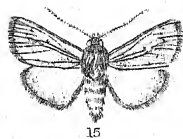
Fam. NOTODONTIDÆ.

CORMA, n. g.

*Male.* Fore wing elongated, narrow, slightly arched towards apex, exterior margin oblique and convex, hind margin slightly lobed near base; subcostal vein six-branched, first branch starting before end of the cell, second trifurcate towards apex, fifth and sixth starting



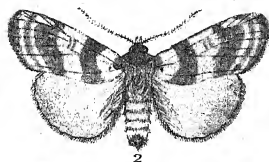
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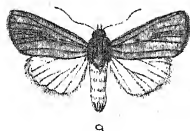
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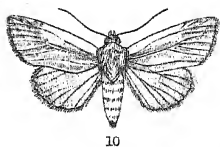
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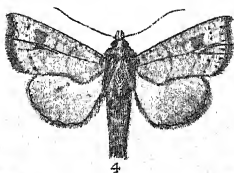
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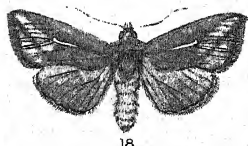
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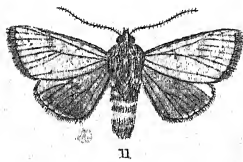
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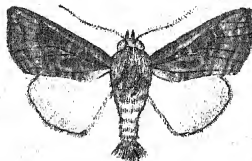
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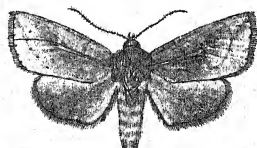
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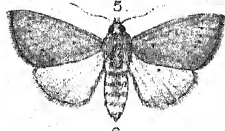
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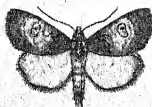
13



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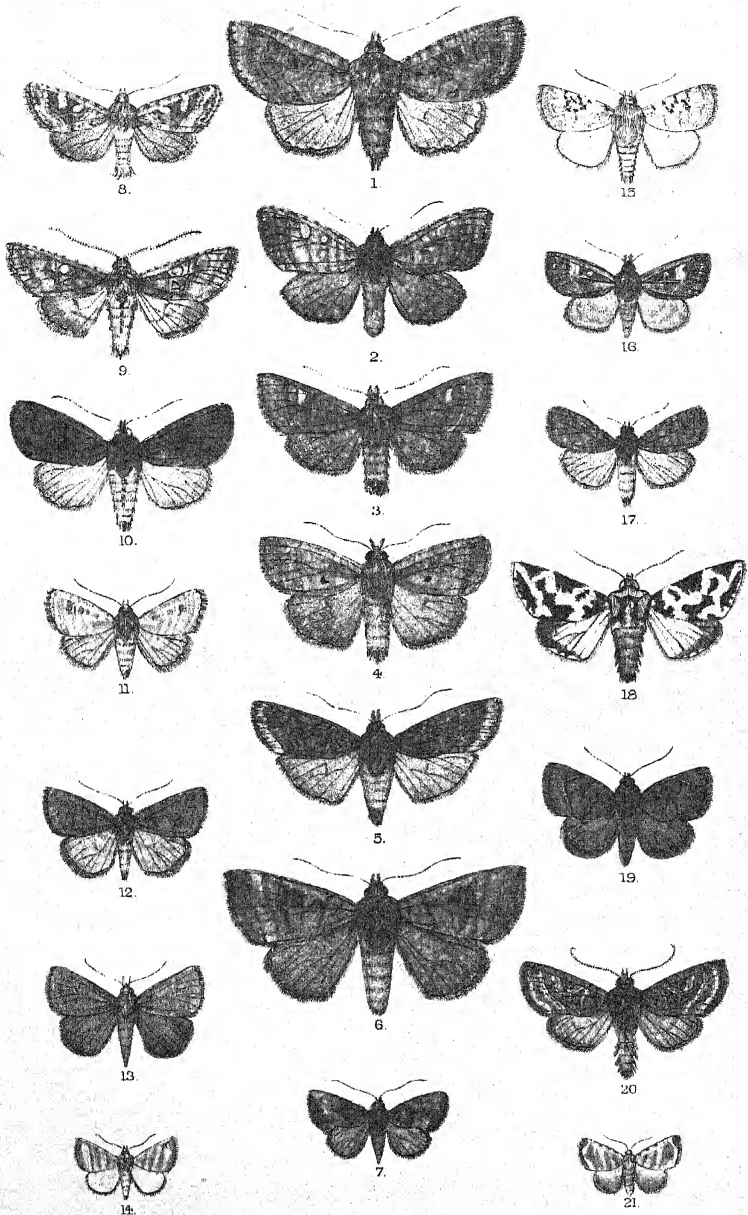


21



14





F.C. Moore del. et lith.

Mintern Bros imp.



together from near base of second, the fifth coalescing with the second at one third its length; discocellulars slightly oblique, radial from their middle; median vein three-branched, two upper from end of the cell; one submedian. Hind wing convex externally; subcostal vein two-branched; discocellulars, radial and median veins as in fore wing. Body long, slender, laxly pilose, tip tufted with spatulate hairs; antennæ long, pectinated rather broadly two thirds their length; palpi short, stout, pilose; legs pilose.

Allied to *Pydna*, Walker.

#### CORMA HORSFIELDI.

*Eumeta horsfieldi*, Moore, Catal. Lep. E.I. C. ii. p. 430 (1859).

*Hab.* Java. Horsfield coll. Brit. Museum.

#### CORMA RAFFLESII.

*Eumeta rafflesii*, Moore, Catal. Lep. E.I. C. ii. p. 430 (1859).

*Hab.* Java. Horsfield coll. Brit. Museum.

### Fam. COSSIDÆ.

#### Genus ZENZERA.

##### -ZENZERA MULTISTRIGATA, n. sp.

*Zenzera indica*, Walker, Catal. Lep. Het. B. M. vii. p. 1536 (1856), nec H.-Schäff.

*Male and Female.* White: fore wing with steel-blue spots along the costa, within the cell, and at its end, and along the exterior and posterior borders, the discal spaces between the veins with steel-blue transverse streaks: hind wing with less prominent similar steel-blue markings within the cell and on anterior border. Body white, six steel-blue spots on hind part of thorax, and seven bands on the abdomen; front of head black; legs steel-blue above, femora white beneath; antennæ black.

Expanse, ♂  $2\frac{5}{8}$ , ♀  $3\frac{3}{8}$  inches.

*Hab.* Darjiling. In coll. Brit. Museum and F. Moore.

*Note.* *Z. paucipunctata*, Walker, *l. c.* p. 1537, is identical with *Z. indica*, H.-Schäff., Lep. Exot. spec. nov. f. 166 (1854).

### Tribe NOCTUES.

#### Fam. CYMATOPHORIDÆ.

##### -Genus THYATIRA, Ochs.

Fore wing with second subcostal branch bifurcate; fourth branch also bifurcate; upper and lower discocellulars concave, upper bent near subcostal; upper radial from the angle near subcostal, and lower radial from their middle; upper median branch from angle above end of the cell, middle branch from its end. Hind wing with the costal vein free at its base from the subcostal, but curved in the middle; first subcostal branch emitted from half length of the cell, curving upward and touching the costal at its middle; radial and

upper median branch from slight angles above end of the cell, middle median branch from end of the cell.

Type *T. batis*, Linn.

*THYATIRA DECORATA*, n. sp. (Plate XXXVII. fig. 1.)

*Male and Female.* Fore wing dark brown, with a peach-coloured basal trilobed spot, a large oval spot within the cell, a smaller spot at its end, an oblique irregular-shaped costal spot before and a similar spot at the apex, a large deep-coloured spot at the posterior angle, and two small marginal spots above it, followed by lunules to the apical spot; an elongated spot on middle of the hind margin; some indistinct pale-bordered black sinuous lines crossing the wing between the spots: hind wing pale brown, with a small marginal pale yellowish patch near anal angle. Body pale ochreous-brown; palpi and legs with dark brown bands.

Expanse ♂  $1\frac{5}{8}$ , ♀  $1\frac{6}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

—*RISOBA*, n. g.

Allied to *Thyatira*. Fore wing somewhat shorter; costal margin arched at apex, angle acute, exterior margin less oblique; second subcostal branch trifurcate, its lowest fork (or fourth branch) near the apex, fifth branch curved upward from end of the cell and touching the third near its base; upper discocellular obliquely concave, slightly bent at its lower end; upper radial straight from end of the cell, lower radial and upper median branch from angles close above end of the cell. Hind wing very convex exteriorly; costal and subcostal veins joined together at their base, two subcostal branches from end of the cell, radial and upper median branch from end of the cell, middle median branch from angle before end of the cell. Body slender; thorax broad, crested in front; antennæ long, minutely pectinated in male.

Type *R. repugnans*.

—*RISOBA REPUGNANS*.

*Thyatira repugnans*, Walker, Catal. Lep. Het. B. M. ix. p. 9.

*Hab.* India, Ceylon.

—*RISOBA OBSTRUCTA*.

*Bolina obstructa*, Walker, MS. Brit.-Mus. Cabinet.

*Male and Female.* Fore wing greyish brown, indistinctly black-speckled; a white basal oblique slender band, which is slightly brownish hindward and has a black sinuous border; a discal greyish white fascia bordered externally by an irregular black line; a black dot within the cell, and a circle enclosing another dot at its end; exterior border traversed by a broad, blackish, whitish-bordered, indistinct band, terminating at the apex in blacker streaks; a marginal row of black lunules bordered inwardly with white: hind wing pale cinereous-brown, with pale-brown marginal band.

Expanse, ♂ 1, ♀  $1\frac{1}{8}$  inch.



*Hab.* Ceylon (*Mackwood*); Calcutta (*Atkinson*). In coll. F. Moore.

*RISOBA PROMINENS*, n. sp.

*Male.* Fore wing pale greenish brown, crossed by black sinuous lines; a prominent white basal, posteriorly obstructed, oblique band; a discal transverse, white, ill-defined fascia, which is broad at the costal end, narrow hindward, and margined by an exterior black sinuous line; exterior border and apex with white-bordered longitudinal apical blackish streaks, transverse sinuous line, and a submarginal row of lunules; an irregular black line and central dot at end of the cell: hind wing cinereous-white, with a broad pale-brown marginal band. *Female* darker, less grey, and discal fascia obsolete; apical streaks and lower sinuous lines bordered with ochreous. Body greyish brown; thorax white-speckled; legs brown above.

Expanse, ♂  $1\frac{3}{10}$ , ♀  $1\frac{4}{10}$  inch.

*Hab.* Khasia Hills (*G.-Austen*); Malacca. In coll. F. Moore.

*RISOBA LITERATA*, n. sp.

*Male.* Fore wing pale greenish brown, with a distinct white transverse basal, outwardly-oblique band, and a discal inwardly-oblique narrow straight band, both bands forming a prominent letter W; dark brown streaks at apex, and two subapical paler sinuous white-bordered lines; a brown pale-circled patch and a dot within the cell: hind wing brownish cinereous, with a broad brown marginal band. Body brown; thorax white; anterior segments of abdomen white-speckled; legs brown above.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Nilgiris. In coll. F. Moore.

Differs from *R. vialis* in the decidedly more distinctly formed bands, and in the absence of any black sinuous outer border; the hind wing also has a broader marginal band.

*RISOBA DIVERSIPENNIS*.

*Heliothis diversipennis*, Walker, Catal. Lep. Het. B. M. xv. p. 1750 (1858).

*Female.* Fore wing pale brown, with a prominent white longitudinal streak from base through the cell, below which is a short basal white streak similarly disposed as in the other species; a dark-brown apical patch with white terminal streaks; outer border crossed by suffused black lines; veins black- and white-spotted; marginal white dentate line very prominent: hind wing cinereous-white, with broad brown marginal band and a discal spot. Body brown; thorax white-speckled; legs brown above.

Expanse  $1\frac{4}{10}$  inch.

*Hab.* Malacca and Singapore. In coll. British Museum and F. Moore.

*KERALA*, n. g.

Fore wing long, narrow, costa slightly arched near the base, apex acute, exterior margin slightly oblique and excavated near posterior

angle; posterior margin somewhat recurved; second branch of subcostal trifurcate near its end; fifth bifurcate, curving upward, and touching the second at one fourth from its base, the fork (or upper radial) emitted from beyond end of the cell; discocellular angled at its lower end; lower radial and two upper median branches from the angles at end of the cell. Hind wing moderately broad, triangular; costal and subcostal veins joined together at their base, subcostal bifurcate at half its length beyond the cell; discocellular angled inward at its middle, and outward near its lower end, the radial from lower angle; two upper median branches on a foot-stalk beyond the cell. Body slender; abdomen smooth; antennæ slender, setose; palpi slender, squamose, apex short and conical; legs squamose.

—KERALA PUNCTILINEATA, n. sp.

*Male*. Yellowish or greyish ochreous; costal area reddish ochreous; all the veins to beyond the middle with alternate black and yellow or grey spots, those on the subcostal branches forming streaks; a transverse black dentated band with white inner border; a pale yellow orbicular and reniform spot, the latter with black outer border; hind wing and abdomen pale cinereous-brown; discal area ochreous. Thorax, head, palpi, and legs yellowish ochreous; legs black-banded.

*Female* reddish ochreous, marked as in male: hind wing uniformly pale cinereous-brown.

Expanse, ♂  $1\frac{3}{8}$ , ♀  $1\frac{5}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

—SARONAGA, n. g.

Fore wing long, narrow; costa arched near base and before the apex, angle acute, exterior margin oblique and convex hindward, posterior margin straight to near its end; second subcostal bifurcate, fourth trifurcate, the upper radial starting from it at some distance beyond end of the cell; discocellulars angled, lower radial from their middle angle; upper median branch from angle above end of the cell, middle branch from its end. Hind wing broad, triangular; costal margin elongated, apex abruptly convex, exterior margin very oblique and convex in the middle; costal and subcostal veins joined together at their base, the two branches of subcostal starting from before end of the cell; discocellular bent in the middle, radial from near its lower end; two upper median branches from acute end of the cell. Thorax and body slender; palpi stout, squamose, third joint short and conical; antennæ long, slender; legs pilose beneath.

—SARONAGA ALBICOSTA.

*Thyatira albicosta*, Moore, P. Z. S. 1867, p. 45.

*Hab.* Darjiling. In coll. F. Moore.

Genus PALIMPSESTIS, Hübner.

*Palimpsestis*, Hübner. Verz. bek. Schmett. p. 237.

*Cymatophora* (part.), Treit.

*PALIMPSESTIS ALTERNATA*, n. sp. (Plate XXXVII. fig. 2.)

Allied to *P. ocularis* of Europe. *Male*. Fore wing pale metallic cupreous-brown, crossed by a broad basal, a median, and two narrow submarginal greenish-grey indistinct bands; some black basal spots, an ante- and postmedian transverse black sinuous line, and black and white streaks externally along the veins: hind wing and abdomen pale cupreous-brown. Thorax greenish grey; collar, front of head, palpi, and legs rufous-brown; legs with black bands.

Expanse  $1\frac{7}{10}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

*PALIMPSESTIS CUPRINA*, n. sp. (Plate XXXVII. fig. 3.)

*Male and female*. Fore wing pale metallic brown, slightly cupreous anteriorly, and the area below the cell greenish; two or three black transverse antemedian lines angled at median vein; some basal spots, a black discocellular recurved mark and a spot within the cell; five or six transverse discal indistinct sinuous lines with black and white dentate marks on the veins; a submarginal pale lunular line and a marginal black line: hind wing pale cupreous-white, with pale cupreous-brown marginal band. Thorax, head, and palpi brown; abdomen paler; collar black; fore and middle legs with black bands.

Expanse  $1\frac{2}{3}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

Fam. BRYOPHILIDÆ.

Genus BRYOPHILA.

*BRYOPHILA LITERATA*, n. sp.

Fore wing greyish white, with a transverse basal black band, a broad median olivaceous-black band bordered inwardly by a black sinuous line, and outwardly by a duplex lunular line, which is convex beyond the cell; a less distinct submarginal zigzag line, with a black costal patch extending between it and the discal line; a marginal black lunular line with the points ending in a ciliary black spot; orbicular and reniform marks each defined by a black line, with inner white border and blackish centre, and forming imperfectly the letters C R, the interspace between the reniform and the outer sinuous duplex line of the same colour as the discal area: hind wing cinereous, with a pale cinereous-brown outer band, less distinct median fascia and discocellular streak; cilia white, spotted with brown. Tegulæ and dorsal tufts fringed with black; palpi and fore tibiae with brown bands.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Cashmere. In coll. F. Moore.

Allied to *B. glandifera*. Differs in having a black subbasal band, the inner black sinuous line of the median band continued to the posterior margin, a less black submarginal irregular fasciated line, and in the marginal black lunular line having the points directed to the ciliary spots.

- *BRYOPHILA NILGIRIA*, n. sp.

Fore wing ochreous-white, with a black transverse subbasal, an antemedian zigzag narrow line, a postmedian sinuous line extending outwardly across the disk to a submarginal zigzag fascia; a black lunular marginal line; orbicular spot small, black-lined and white-centred, reniform mark large and formed only by a black line, their interspace blackish: hind wing cinereous-brown, palest at base; cilia white. Thorax cinereous-white; tegulæ and dorsal tufts black-fringed; abdomen cinereous-brown; palpi, and legs above, banded with black.

Expanse  $1\frac{1}{8}$  inch.

*Hab.* Ooty, Nilgiris. In coll. F. Moore.

- *BRYOPHILA MEDIANA*, n. sp.

Fore wing with a broad median transverse olive-brown band, the inner margin of which is defined by a white-bordered black-pointed zigzag line, and the outer margin by a similar sinuous line; orbicular and reniform marks indistinctly white-bordered and confluent at their lower end; a short subbasal olive-brown costal band; the area between the base and median band, and the entire outer border of the wing, clouded with olive-brown speckles; an indistinct slender black marginal line: hind wing cinereous-brown; cilia white.

Expanse  $1\frac{1}{10}$  inch.

*Hab.* Solun, Punjab. In coll. F. Moore.

- *BRYOPHILA MODESTA*, n. sp.

Fore wing pale brownish ochreous, with an indistinct black-speckled, subbasal, transverse band, an antemedian and a postmedian sinuous black-speckled line; the entire area from the antemedian line to the outer margin clouded with black speckles; orbicular mark black, reniform ill-defined; a slight marginal black lunular line: hind wing cinereous-brown, cilia whitish. Body brownish ochreous; palpi and fore legs above with slight brown bands.

Expanse 1 inch.

*Hab.* N.W. Himalaya. In coll. F. Moore.

Allied to *B. alge*.

## Fam. BOMBYCOIDÆ.

Genus *ACRONYCTA*, Oechsenheimer.- *ACRONYCTA BICOLOR*, n. sp.

Fore wing black, minutely speckled with grey; orbicular and reniform marks and transverse sinuous lines indistinctly blacker: hind wing white; costal and subcostal veins slightly black-speckled; a marginal row of black-speckled spots and ciliary border. Thorax, palpi, and legs black, grey-speckled; tarsi with pale bands; abdomen brown, with black dorsal bands.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* Solun, Punjab (N.W. India). In coll. F. Moore.

## Genus TRIÆNA, Hübner.

## TRIÆNA MAXIMA, n. sp.

Allied to *T. tridens* of Europe. Fore wing grey, speckled with brown; an oblique, transverse, subbasal black duplex sinuous line, and a similar but more sharply-pointed sinuous discal line; a marginal row of black spots; a longitudinal irregular black basal streak along the median vein, which nearly joins a straight streak to the outer margin; orbicular and reniform spots black-lined and joined by an intervening upper black linear streak: hind wing pale greyish cinereous, with the veins, a discal line, and a marginal band cinereous-brown. Thorax grey, abdomen greyish cinereous; palpi and legs with dark bands.

Expanse  $2\frac{1}{4}$  inches.

*Hab.* Punjab Hills, N.W. India (*B. Powell*). In coll. F. Moore.

## Fam. LEUCANIIDÆ.

Genus ALETIA<sup>1</sup>, Hübner.

*Aletia*, Hübn. Verz. bek. Schmett. p. 239 (1816.)

*Hyphilare*, Hübn. *ibid.*

## ALETIA ANGULIFERA, n. sp.

*Male.* Allied to *A. conigera* (*Noctura. conigera*, Schiff.). Fore wing ochreous-yellow, indistinctly clouded with red-ochreous scales; crossed by a reddish-black antemedian outwardly-bent line and an oblique postmedian line, which is bent inward at costal end; a whitish spot at lower end of the cell, a pale-yellow reniform and orbicular space; marginal and cilia lines black-speckled: hind wing pale dusky brown, cilia pale yellow. Thorax, head, palpi, and legs ochreous-yellow; abdomen paler.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* N.W. Himalaya, Cashmere (Sind valley). In coll. F. Moore and Dr. Staudinger.

## ALETIA DISTINCTA, n. sp. (Plate XXXVII. fig. 4.)

Allied to *A. vitellina*, Hübn. *Male.* Fore wing deep ochreous-yellow, sparsely crossed by short irregularly disposed red strigæ, more or less black-speckled; a prominent antemedian and postmedian transverse curved narrow band of the same colour, but more blackly speckled, beyond which is a discal row of black spots followed by a white streak—one on each vein; a marginal series of black dots—one on each vein; orbicular and reniform space marked by red strigæ; space beyond the cell to the postmedian band clouded with dusky red; cilia from apex to near end of hind margin thickly black-speckled: hind wing pale ochreous-brown posteriorly, yellowish anteriorly; cilia pale yellowish. Thorax, head, palpi, and legs deep ochreous; a slight black-speckled collar, a few speckles on tegulæ, and a cluster at base of pale ochreous abdomen.

Expanse  $1\frac{5}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

Type *A. vitellina*, Hübn.

## —BOROLIA, n. g.

Fore wing narrow; costa slightly arched at the base, apex pointed, exterior margin slightly oblique, posterior angle convex; cell narrow; first subcostal branch emitted at half length of the cell and extending close alongside the costal; second emitted before end of the cell, trifid; the third starting from near its base above the cell, and touching the fifth; fourth short, fifth emitted and curving upwards from end of the cell; upper discocellular short, outwardly oblique, lower concave; radial from end of upper discocellular; lower radial and two upper median branches from angles at lower end of the cell, fourth at some distance before the end; submedian recurved. Hind wing with long costal margin, exterior margin very oblique, abdominal margin short; subcostal straight, both branches emitted from end of the cell; discocellulars concave; radial from their middle; median straight, two upper branches from end of the cell. Cilia broad. Antennæ setulose; palpi ascending, pilose beneath, second joint long, third short and slender; femora pilose beneath.

Type *B. furcifera*.

## —BOROLIA FASCIATA, n. sp. (Plate XXXVII. fig. 12.)

*Male and Female.* Upperside—fore wing pale brownish-ochreous, palest along the costa; an irregular bordered chestnut-brown fascia from the base to below the apex, which is bordered below the base by a short darker streak; a black dot at base of the wing, and two transverse discal indistinct rows of dots, which in the female are apparently joined together by an intervening line; a marginal row of black dots: hind wing pale brown. Underside paler; fore wing with a slightly darker discal area; hind wing with an indistinct discocellular spot, transverse discal linear streaks, and marginal spots. Palpi brown at the side.

Expanse ♂  $1\frac{2}{3}$ , ♀  $1\frac{3}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

## Genus LEUCANIA.

## —LEUCANIA BISTRIGATA, n. sp. (Plate XXXVII. fig. 18.)

*Female.* Fore wing pale ochreous, with a suffused brown fascia from the base through the cell to end of the costa, another fascia obliquely from below the apex, and extending along the exterior margin; a very prominent, white, black-bordered terminally-bent streak at lower end of the cell, the outer veins also whitish; a black basal streak below the cell, and another streak below the submedian vein; three very indistinct black dots on the costal edge, some across the disk, a marginal series of minute black points bordered with pale outer cilia lines: hind wing pale ochreous-brown; cilia ochreous-white with a brown line. Thorax with a black- and white-speckled crest, collar, and tegulæ; palpi and legs brown-speckled; abdomen pale ochreous.

Expanse  $1\frac{7}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

Allied to *L. decissima*, Walker; may be distinguished from it by having a linear discoidal streak much more clearly defined, the two basal black streaks, and by the cilia of fore wing being distinctly lined.

—*LEUCANIA PENICILLATA*, n. sp.

Fore wing pale greyish ochreous, with a dusky-brown suffused fascia from the base through the cell to apex, and extending obliquely from below the apex along the exterior margin, the oblique interspace from the apex whitish; external veins whitish; a prominent, short, white, black-bordered terminally-bent streak at lower end of the cell; a black streak below base of the cell, and another below submedian vein; costal border slightly black-speckled; some indistinct black dots disposed across the disk, and a marginal row of black points; cilia with brown lines: hind wing greyish brown, whitish at the base, the veins darker, and with an indistinct discocellular darker lunular spot; cilia white, with a brown line. Thorax and collar speckled with black and grey; palpi and legs black-speckled; male with a black tuft at the base of abdomen beneath.

Expanse  $1\frac{4}{12}$  inch.

*Hab.* Solun, Punjab; Dalhousie (N.W. India). In coll. F. Moore.

Allied to *L. bistrigata*.

—*LEUCANIA MODESTA*, n. sp. (Plate XXXVII. fig. 11.)

*Male and Female.* Fore wing pale ochreous, external area below the apex slightly darker, with an antemedian transverse indistinct sinuous black line, a postmedian series of points, and marginal row of black dots: hind wing pale brownish-ochreous and yellow along the costal border, with an indistinct darker discocellular lunular spot and marginal spots. Tegulae very slightly black-speckled.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

—*LEUCANIA LINEATIPES*, n. sp.

*Male.* Fore wing pale ochreous, with a distinct straight white line along the median vein from the base to the outer margin, a brown fascia extending below the cell; a black discocellular spot at lower end of the cell, four or five points across the disk, and a marginal row of minute dots: hind wing pale brownish ochreous, outer border slightly darker, and with indistinct minute black dots below the apical margin. Front of head and palpi darker and brighter ochreous-brown; legs in front with a brown longitudinal streak.

Allied to *L. impura*.

Expanse, ♂  $1\frac{2}{10}$ , ♀  $1\frac{4}{10}$  inch.

*Hab.* Cherra Punji, E. Bengal. In coll. F. Moore.

—*LEUCANIA ADUSTA*, n. sp.

*Male and Female.* Fore wing ochreous-yellow; median and sub-

median veins white; borders of the veins and a line between each vein ochreous-brown; costal border and an oblique apical streak ochreous-brown; a few black speckles disposed on the costa, also within and below the cell; a discal series of black-speckled spots, one on each vein, and a marginal row of spots; cilia brown: hind wing ochreous-white, external area pale cupreous-brown; marginal spots black; cilia white. Underside ochreous-white, suffused with pink externally; both wings speckled with brown on anterior and exterior borders, and with a marginal row of black spots; fore wing with a small black costal spot before the apex.

Expanse, ♂  $1\frac{3}{8}$ , ♀  $1\frac{1}{8}$  inch.

*Hab.* Manpuri, N.W. India (*Horne*), Darjiling; Khasia Hills (*Atkinson*). In coll. F. Moore and Dr. Staudinger.

*LEUCANIA SUBSIGNATA*, n. sp.

*Male.* Fore wing pale ochreous, darker between the veins; several minute black speckles disposed along the costal border below the cell, two clustered series within the cell, and others beyond the cell; a discal and marginal row of minute black spots: hind wing white, discal area brownish. Underside paler; fore wing with a black costal spot before the apex; hind wing with a few black speckles on anterior border.

Expanse 1 inch.

*Hab.* N.W. Himalaya. In coll. F. Moore.

—*LEUCANIA CONSIMILIS*, n. sp. (Plate XXXVII. fig. 19.)

*Male.* Near to *L. decissima*, but differs in being larger, paler, and more uniformly coloured. Fore wing with paler linear markings between the veins, the white portion of the discoidal streak half its length and less distinct, the transverse discal spots and the subbasal series more loosely speckled, the marginal series less distinct, the basal two thirds of the wing also sparsely sprinkled with black speckles: hind wing paler brown, and whitish at the base. Underside of both wings ochreous-white, with an indistinct transverse discal brown line. Thorax, head, and palpi brown-speckled; legs with pale-brown streaks.

Expanse  $1\frac{7}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

—*LEUCANIA COMPTA*, n. sp. (Plate XXXVII. fig. 8.)

*Male.* Fore wing pale brownish ochreous, veins ochreous-white, with intervening pale white and brown lines; a transverse discal row of distinct minute black points; subcostal branches and median with its branches slightly black-bordered to the discal points; two indistinct black spots on the costa, one below the cell, and two on the submedian vein; marginal row of black dots indistinct: hind wing ochreous-white, veins and the apical border ochreous-brown. Thorax, palpi, and legs above brownish ochreous with darker speckles; abdomen ochreous-white.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Pudda river (*Atkinson*). In coll. Dr. Staudinger.



—*LEUCANIA NAINICA*, n. sp. (Plate XXXVII. fig. 15.)

*Male and Female.* Fore wing very pale reddish ochreous, palest along the veins; a few minute black speckles along the costal and posterior borders; median vein and its two upper branches white, bordered with a brown streak above and below the cell, a black spot at end of the cell, a transverse discal series of minute black points, and a marginal row of dots: hind wing slightly paler, outer margin suffused with brown; cilia whitish. Thorax in front, palpi, and legs above brown-speckled.

Expanse, ♂  $1\frac{2}{1\frac{1}{2}}$ , ♀  $1\frac{4}{1\frac{1}{2}}$  inch.

*Hab.* Naini Tal, N.W. Himalaya. In coll. Dr. Staudinger.

—*LEUCANIA ALBISTIGMA*, n. sp. (Plate XXXVII. fig. 9.)

*Female.* Fore wing pale brownish ochreous, greyish along the costal border and obliquely below the apex; veins speckled with grey and brown, most prominently along the median and its branches; an indistinct curved discal series of minute black points; a small brown spot in middle of the cell, and a black streak extending through and beyond its end, which is crossed by a white discocellular spot; a slender black streak below end of the cell: hind wing ochreous-white; veins lined with brownish ochreous. Thorax, palpi, and legs greyish ochreous, the palpi and legs brown-speckled; abdomen ochreous-white.

Expanse  $1\frac{2}{1\frac{1}{10}}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

—*LEUCANIA HOWRA*, n. sp. (Plate XXXVII. fig. 16.)

*Female.* Fore wing pale brownish ochreous, greyish along base of the costa, below the apex, and below the cell; brown-speckled; veins ochreous-white, the subcostal branches and the median with its branches lined with brown to the discal black points; a brown line between all the veins, and a prominent black basal streak below the cell; a marginal row of minute black dots: hind wing ochreous-white; veins brownish ochreous, some marginal black dots. Thorax, palpi, and legs greyish ochreous, speckled with brown; abdomen ochreous-white.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Calcutta. In coll. Dr. Staudinger.

—*LEUCANIA RUFISTRIGOSA*, n. sp.

*Female.* Near to *L. dharmia*. Fore wing pale yellowish ochreous, with a reddish-ochreous longitudinal fascia through the cell to apex, and extending paler obliquely below the apex; ochreous-red incomplete lines between the veins; an indistinct series of discal black points and a black spot below the cell; median vein and its two upper branches to the discal black points white bordered with black, the white very distinct and sharply defined for half length of the cell: hind wing and abdomen pale brown, with a slightly darker discocellular spot. Underside paler; fore wing with the costal border pale brown, the discoidal area and median veins dusky brown:

hind wing brown-speckled, with a distinct blackish discocellular lunular spot. Legs brownish above.

Expanse  $1\frac{4}{5}$  inch.

*Hab.* Umballa, N.W. India. In coll. F. Moore.

—*LEUCANIA ABDOMINALIS*, n. sp.

*Female.* Fore wing ochreous-white, with very pale ochreous-yellow lines between all the veins, a slightly darker shade below the cell and obliquely below the apex; a small black spot below the cell, two on the disk, and a marginal row of minute dots: hind wing ochreous-white on costal half, pale ochreous-brown on anal half. Underside ochreous-white, subcostal and median vein brown-speckled; hind wing sparsely brown-speckled, with a prominent blackish discocellular spot; both wings with a marginal row of distinct black dots. Body ochreous-white, abdomen above and beneath brown-speckled; palpi and legs above pale brownish ochreous.

Expanse  $1\frac{4}{5}$  inch.

*Hab.* Bengal (*Russell*). In coll. F. Moore.

—*LEUCANIA DHARMA*, n. sp. (Plate XXXVII. fig. 17.)

*Female.* Near to *L. album*. Fore wing pale ochreous-brown, costal and posterior borders and oblique fascia below the apex paler; a pale brown line between the veins; veins whitish, the median and its branches to the transverse discal indistinct, black points most prominent; a black spot within end of the cell; a few black speckles on costal and posterior borders: hind wing and abdomen paler brown, whitish at the base. Underside uniformly paler and brown-speckled; fore wing with a black costal spot and indistinct transverse brownish fascia; hind wing with a transverse discal series of brown points, one on each vein, and discocellular lunular spot. Thorax grey, with black speckles; front of head, palpi, and legs above pale brown with darker speckles.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

—*LEUCANIA ALBICOSTA*, n. sp. (Plate XXXVII. fig. 10.)

*Female.* Similar to same sex of *L. dharmæ*, but paler-coloured: fore wing with the costal border, apical fascia, and posterior margin ochreous-white, the veins and lines between them not so prominent, the median vein being of the same uniform colour as the others; an indistinct blackish spot on the costa, and another spot below the cell. Underside—fore wing with discal area broadly brownish; hind wing brown-speckled, and with a prominent blackish discocellular spot and marginal row of dots. Thorax very pale and not speckled; palpi and legs above pale ochreous-brown and not speckled.

Expanse  $1\frac{4}{5}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

—*LEUCANIA CANARAICA*, n. sp.

*Female*. Fore wing pale whitish ochreous; veins whiter, with narrow ochreous-brown lines between each vein; an indistinct marginal row of minute black dots; hind wing white. Underside uniformly paler. Front of thorax banded with ochreous; palpi at sides and fore legs above brownish-ochreous.

Expanse 1 inch.

*Hab.* Canara, S. India (*Ward*). In coll. F. Moore.

—*LEUCANIA UNIFORMIS*, n. sp.

Fore wing ochreous-brown, with chestnut-brown streaks between the veins; all the veins ochreous-white; an indistinct discal series of black spots, a spot below the cell, and a marginal row of dots; hind wing ochreous-white, veins and marginal line brownish. Underside pale ochreous-white, suffused with pale brown; a marginal row of black spots. Body pale, and legs ochreous-brown.

Expanse  $1\frac{1}{8}$  inch.

*Hab.* N.W. Himalaya. In coll. F. Moore.

—*LEUCANIA PROMINENS*, n. sp.

Fore wing pale pinkish ochreous-brown, with a brighter chestnut-brown fascia extending from base through the cell and below the apex; the base of the costal border and obliquely below the apex whitish ochreous; costal and median veins white, the latter most prominent; an indistinct costal dot and a few speckles near the apex, a discal series of black points, and a marginal row of black dots; hind wing pale brown, veins darker, with a dusky discocellular spot. Cilia pale ochreous. Underside pale pinkish ochreous: fore wing with the discal area from the base dusky brown; some black costal speckles and a marginal row of dots; hind wing with black-speckled marginal row of dots and a large discocellular spot.

Expanse  $1\frac{4}{10}$  inch.

*Hab.* Darjiling; Cherra (*Austen*). In coll. F. Moore.

—*LEUCANIA GRISEOFASCIATA*, n. sp.

Fore wing very pale yellowish ochreous, with a pale reddish-ochreous fascia extending from the base to exterior margin, and including a brownish-grey fascia below the cell; median vein and its middle branch white, the upper branch also greyish white; a black-speckled spot at lower end of cell, a black streak below base of the cell; a few black speckles along base of costal border, about the disk and hind border, and a slightly distinct series across the disk; a marginal row of slight black dots; cilia brownish: hind wing pale ochreous-brown, palest at the base. Thorax fringed with black and grey in front; base of abdomen with white hairs; palpi at the side and legs above black-speckled.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Dalhousie, N.W. Himalaya. In coll. F. Moore.

*LEUCANIA LANCEATA*, n. sp.

Fore wing pale yellowish ochreous, with dark brownish ochreous lines between the veins, which are somewhat confluent through the middle, and form an indistinct interrupted fascia below the cell to exterior margin below the apex; a suffused blackish spot outside end of the cell; the cell-streak broad, nearly white, and crossed near its inner end by a lanceolate black mark, the cell beyond bordered beneath by a slight black line; some minute black speckles on the costal border; a distinct series of black spots curving across the disk, and a marginal row of points: hind wing pale whitish ochreous, with brownish ochreous broad outer border, and a marginal row of black points. Body and legs brownish ochreous.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Ceylon. In coll. F. M. Mackwood.

Allied to *L. decissima*, Walker, but is a smaller insect.

Genus *SIMYRA*, Ochs.*SIMYRA CONSPERSA*, n. sp.

*Female.* Upperside—fore wing pale whitish ochreous, numerous covered with minute brown speckles: hind wing white. Thorax ochreous, abdomen paler. Underside uniformly pale ochreous-white. Near *S. confusa*.

Expanse  $1\frac{7}{12}$  inch.

*Hab.* Manpuri, N.W. India (*Horne*); Calcutta (*Atkinson*). In coll. F. Moore.

*NORRACA*, n. g.

*Male.* Fore wing very long, narrow, apex slightly falcate, exterior margin very convexly oblique, posterior margin slightly lobed near the base; costal vein long, extending to two thirds of the wing; subcostal running close to costal, first branch emitted at two thirds from the base, second trifurcate, third from one half of second, fourth very short and emitted near the apex, fifth from end of the cell; discocellulars concave; upper radial from end of the cell, lower radial from middle of discocellulars; two upper median branches emitted immediately before end of the cell, third at some distance before its end; submedian short. Hind wing triangular, apex slightly produced, exterior margin very oblique, abdominal margin short; costal vein extending to the apex, subcostal to nearly end of the cell running close to the costal, two subcostal branches emitted from just beyond end of the cell; discocellular obliquely concave; cell broad; radial from middle of discocellular; two upper median branches from immediately before end of the cell, lower at from some distance before its end; submedian and internal vein extending to anal angle. Body long, somewhat slender; palpi short, slender, pilose, apex short; legs densely pilose, antennæ setose. Allied to *Ipana*.

*NORRACA LONGIPENNIS*, n. sp.

*Male.* Fore wing pale yellowish ochreous, duller-coloured below

the apex; with a very indistinct recurved discal transverse series of small black spots and outer recurved speckled fascia; a few indistinct black spots on cilia just below the apex: hind wing pale straw-yellow. Underside uniformly paler ochreous. Body pale yellowish ochreous; front and middle legs brighter ochreous.

Expanse  $1\frac{7}{8}$  inch.

*Hab.* Penang. In coll. F. Moore.

### Genus *AXYLIA*, Hübner.

#### *AXYLIA RENALIS*, n. sp.

Fore wing pale reddish-ochreous, with the costal border iron-grey; orbicular and reniform spot very prominent, black-lined, and centred with iron-grey; veins speckled with grey and black; a black fascia extending through the cell to outer margin; a black subbasal transverse sinuous double line, some discal spots, and a marginal row of dentate spots: hind wing pale brownish white, darker along costal border. Thorax black above, ochreous laterally and in front; abdomen pale brown; palpi black, tipped with ochreous; legs black, fore and middle tibiæ ochreous.

Expanse  $1\frac{1}{10}$  inch.

*Hab.* Sind valley, Kashmir; Solun, Punjab. In coll. F. Moore.

Allied to the European *A. putris*.

#### *AXYLIA FASCIATA*, n. sp.

Fore wing pale yellowish ochreous, with a longitudinal blackish fascia through the lower part of the cell to outer margin, the area below it being slightly greyish; a black streak below the cell; median veins grey-speckled, the second upper median branch white with black intervening lines; discal area above the fascia and the posterior margin suffused with reddish ochreous, and white below the fascia; orbicular and reniform spots formed of interrupted black lines, with an almost confluent black interspace; some indistinct black dots obliquely across the disk: hind wing ochreous-white, outer border slightly dusky, marginal line black.

Expanse  $1\frac{2}{10}$  inch.

*Hab.* Solun, Punjab; Ceylon. In coll. F. Moore.

#### *AXYLIA IRRORATA*, n. sp.

Fore wing pale yellowish ochreous, profusely black-speckled, most thickly and somewhat confluent through the lower end of the cell to the exterior margin; orbicular and reniform spot imperfectly formed of black speckles, with an intervening black spot; an indistinct discal row of blackish speckles and marginal series of dots: hind wing white, with brownish border and marginal dots. Body, palpi, and legs pale ochreous; thorax and palpi black-speckled.

Expanse  $1\frac{1}{10}$  inch.

*Hab.* N.W. Himalaya. In coll. F. Moore.

—*AXYLIA ALBIVENA*, n. sp.

Fore wing pale straw-yellow; median vein and middle branch white; a slight black-speckled fascia extending below the cell to the outer margin; orbicular and reniform spots ill-defined by black speckles and with a more distinct black intervening spot; a few black speckles scattered irregularly over the wing, and a marginal row of black dots: hind wing white, with a marginal row of black dots.

Expanse  $1\frac{1}{10}$  inch.

*Hab.* Solun, Punjab. In coll. F. Moore.

Fam. APAMIIDÆ.

Genus *HYDRÆCIA*.

—*HYDRÆCIA KHASIANA*, n. sp. (Plate XXXVII. fig. 5.)

*Male.* Fore wing dull reddish brown, washed with purple-grey, with a brighter brown pale-bordered subbasal sinuous line, a large orbicular and reniform spot, and discal sinuous line; outer border also brighter and traversed by a pale waved line; median and sub-median veins dusky brown: hind wing cinereous-white, with pale brown veins and indistinct marginal fascia. Thorax, head, palpi, and legs reddish brown, grey-speckled; abdomen paler. Underside much paler.

Expanse  $1\frac{6}{10}$  inch.

*Hab.* Khasia Hills, E. Bengal. In coll. Dr. Staudinger.

Near to *H. petasitis*.

Fam. XYLOPHASIIDÆ.

Genus *RHIZOGRAMMA*, Lederer.

—*RHIZOGRAMMA INEXTRICATA*, n. sp.

*Male and Female.* Fore wing brownish grey, veins speckled with black and white; a transverse discal, sharply sinuous, white-bordered black line; some pale-bordered black streaks from the base below the cell, oblique short streaks on middle of the costa; a brown interrupted marginal fascia from the apex, the hind margin broadly grey-brown; orbicular mark represented by a long brown double streak, which crosses and breaks up an indistinctly formed reniform mark; a marginal row of black points: hind wing white at the base, with a pale brownish marginal band. Thorax brownish grey, with black-speckled collar and tegulæ; palpi brown, tip ochreous; legs grey, brown-speckled; abdomen grey-brown.

Expanse  $2\frac{1}{8}$  inches.

*Hab.* Dalhousie, N.W. Himalaya; Solun, Punjab. In coll. F. Moore.

Allied to *R. indica* (*Xylophasia indica*), Moore, and to the European *R. petrorhiza*, Bork.

—*SASUNAGA*, n. g.

Fore wing very narrow; costa almost straight; exterior margin oblique, convex, waved; posterior margin convex at the base; costal

vein extending two thirds the margin; first subcostal branch emitted at two thirds and second at one fourth before end of the cell, third branch one third, and fourth at one half from below second, fifth curving from end of the cell and free from the third; upper radial from end of the cell, discocellular obliquely concave, lower radial from near its middle; cell long, very narrow at the base; upper median branch from angle above end of the cell, middle branch from the end, lower at one fourth before the end; submedian curved downward near the base. Hind wing very broad, triangular; costa convex near the base, apex convex; exterior margin very oblique, waved; abdominal margin long; costal vein slightly arched near the base, extending to apex; two subcostal branches from end of the cell; discocellular slender, concave; radial very slender, emitted from below middle of discocellular; cell short, broad; two upper median branches from end of the cell, lower at one fourth before the end; submedian and internal vein straight, the latter extending to anal angle. Thorax robust; abdomen long, somewhat slender, and extending beyond the wing; palpi ascending, slender, second joint squamose, reaching to vertex, third joint half its length, cylindrical; femora pilose beneath, tibiæ tufted above; antennæ setose.

Near to *Dipterygia*. The American genus *Magusa* (Walker, Catal. Lep. Het. B. M. xi. p. 762) is a very closely allied form.

—*SASUNAGA TENEBROSA*.

*Hadena tenebrosa*, Moore, P. Z. S. 1867, p. 59.

Fore wing dark brown, with short ochreous-bordered blackish costal streaks, lengthened longitudinal upper discal and less distinct lower discal streaks, and oblique streaks below the cell, the latter bordered by an ascending lower discal, curved, duplex sinuous pale-pointed black line, and a submarginal less distinct pale-pointed sinuous line, the ochreous borders palest before the apex; orbicular spot small, ochreous, with black border, reniform spot less distinct; hind wing glossy cupreous-brown, palest at the base; cilia cinnamon-brown. Thorax dark brown, black-speckled; abdomen pale brown, tuft ochreous; palpi and legs ochreous, brown-speckled; tarsi with blackish bands.

Expanse, ♂  $1\frac{1}{4}$ , ♀  $1\frac{5}{8}$  inch.

*Hab.* Darjiling. In coll. F. Moore and Dr. Staudinger.

*Remark.* Some specimens of this insect are pale ochreous-brown, with less distinct darker brown and black streaks, and also show a darker subapical costal patch.

Genus *NEURIA*, Guénée.

—*NEURIA SIMULATA*, n. sp. (Plate XXXVIII. fig. 1.)

*Female.* Allied to *N. separata*; differs in its larger size and paler colour, the fore wing having less distinct transverse sinuous markings, orbicular and reniform spots, and a shorter and broader dentate mark below the cell.

Expanse 2 inches.

*Hab.* Darjiling. In coll. Dr. Staudinger.

## -NEURIA INCISA, n. sp.

*Male and Female.* Fore wing dark ochreous-brown, with a transverse basal, an antemedian, and a postmedian sinuous black-bordered ochreous-yellow line; the median vein and its lower branch, broadly to the disk, and the discal borders of the other veins pale ochreous-yellow; a distinct submarginal and a posterior marginal yellow line; a marginal black dentated line; orbicular spot small, oblique, pale-bordered; reniform spot large and extending below the cell, pale-bordered, the intervening spaces black; some pale-bordered black streaks on the costa; a black broad conical mark below the cell; cilia with white-tipt pale streaks; hind wing and abdomen pale brown. Thorax, head, palpi, and legs above dark ochreous-brown, legs with pale ochreous bands.

Expanse  $1\frac{5}{8}$  inch.

*Hab.* Solun, Punjab; Umballa; Dalhousie (N.W. Himalaya). In coll. F. Moore.

## -NEURIA SIMILLIMA, n. sp.

A smaller insect than *N. incisa*. Fore wing of a dark purple-brown; the markings similar, but the transverse basal, antemedian, and postmedian sinuous lines, the orbicular spot, and costal streaks are greyish purple, the median branch, the submarginal line, the posterior border, and the reniform only being ochreous-yellow: hind wing pale purplish cinereous-brown, the base being whitish. Thorax, palpi, and legs dark purple-brown, legs with pale bands.

Expanse  $1\frac{8}{12}$  inch.

*Hab.* Solun, Punjab. In coll. F. Moore.

## Genus THALPOPHILA, Hübner.

## -THALPOPHILA INDICA, n. sp.

Fore wing rufous-brown, basal and discal areas speckled with black and grey scales; crossed by a basal, antemedian, and a postmedian black-bordered rufous sinuous double line, the two latter greyish hindward, and a submarginal rufous lunular line; orbicular and reniform marks black-lined, and a black quadrate mark below the cell; hind wing yellow, with uniformly inner-margined brown exterior band. Thorax, head, palpi, and legs rufous-brown; abdomen yellowish brown.

Expanse  $1\frac{5}{6}$  inch.

*Hab.* Masuri, N.W. Himalaya. In coll. F. Moore.

Near to European *T. texta*.

## -THALPOPHILA CALLOPISTRIOIDES, n. sp.

Fore wing dark rufous-brown, veins pale-lined; black-speckled; crossed by a prominent whitish black-bordered zigzag basal line, a waved convex antemedian line, and a lunular recurved postmedian line; orbicular and reniform marks and oblique costal streaks above them white-lined; a submarginal acutely sinuous white line, and marginal black lunules with white borders; a small discocellula



white spot at lower end of the cell: hind wing golden-yellow, with broad cupreous-brown marginal band. Thorax, head, palpi, and legs above dark rufous-brown; abdomen golden-yellow, with brownish tip.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* N. India. In coll. F. Moore.

### Genus APAMEA, Ochs.

#### —APAMEA CUPRINA, n. sp. (Plate XXXVIII. fig. 2.)

Allied to *A. leucostigma*. Fore wing dark cupreous-brown, with indistinct grey transverse sinuous fasciæ; costal and median veins grey-speckled; orbicular and reniform marks grey, the latter also black-speckled: hind wing pale cupreous-brown. Thorax, palpi, and legs above dark brown; abdomen ochreous-brown.

Expanse  $1\frac{5}{10}$  inch.

*Hab.* Sikkim (*Blanford*, 1870). In coll. Dr. Staudinger.

#### —APAMEA PANNOSA, n. sp.

Fore wing dark ferruginous-brown, with a pale whitish-ochreous sinuous patch at the apex and diffused patches along the posterior border; a transverse subbasal, antemedian, and a postmedian, pale-ochreous centred, black, double sinuous lines; orbicular and reniform spots black-lined with pale inner border and ferruginous centre; an indistinct submarginal pale sinuous line with black points: hind wing and abdomen cinereous-brown, darkest externally. Thorax, palpi, and legs above dark ferruginous, legs with black bands.

Expanse  $1\frac{7}{10}$  inch.

*Hab.* Nilgiris, S. India; Ceylon. In coll. F. Moore.

#### —APAMEA LATIFASCIATA, n. sp.

Fore wing dark ferruginous greyish brown, with the discal area and posterior margin broadly pale ochreous; a transverse antemedian and postmedian sharply-sinuous black lines bordering the dark ferruginous and forming a median band; orbicular and reniform spots pale-centred: hind wing pale cinereous. Body ferruginous; thorax, palpi, and legs dusky ferruginous, legs with black bands.

Expanse  $1\frac{3}{8}$  inch.

*Hab.* Manpuri, N.W. India (*Horne*). In coll. F. Moore.

#### —APAMEA MUCRONATA, n. sp. (Plate XXXVIII. fig. 8.)

*Male and Female.* Fore wing pale ferruginous, with a broad medial transverse darker ferruginous band bordered by an antemedian and a postmedian double black sinuous lines, the latter with very long outer discal points; orbicular and reniform spots black-lined and pale-centred; a ferruginous black-speckled spot and some contiguous streaks at base of the wing; some streaks on costal border, and a marginal irregular fascia bordered by the black lunular points with pale tips: hind wing and abdomen pale pinkish brown. Thorax,

palpi, and legs pale ferruginous; palpi laterally and legs above slightly brown-streaked. Near to *A. undicilia*, Walker.

Expanse  $1\frac{4}{5}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

--- *APAMEA STRIGIDISCA*, n. sp. (Plate XXXVIII. fig. 9.)

*Male.* Fore wing dark ferruginous; costal border, some basal streaks, and discal area paler ferruginous; a transverse antemedian and postmedian sinuous pale-bordered black lines; orbicular and reniform spots black-lined, with a pale inner border and blackish centre; a black conical mark below the orbicular spot; a submarginal transverse pale line, the middle portion zigzag and longitudinally crossed by a black line between the median veins; base of cell and posterior margin black-streaked; submedian vein black; some black streaks on the costal border, and a marginal waved line with a row of black points: hind wing pale ferruginous-brown. Body ferruginous; collar and tegulae, front of head, palpi laterally, and bands on legs black.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

The markings in this species are somewhat similar to those in *Mamestra adjusta*, Esper.

--- *APAMEA BASALIS*, n. sp.

Fore wing dusky ferruginous-brown; veins broadly grey-speckled, with intervening cupreous-brown longitudinal streaks; two indistinct subbasal and a median transverse black sinuous line; orbicular spot black-lined; reniform spot pale ochreous and ill-defined; discal and apical areas with pale ochreous longitudinal streaks; a marginal row of black dentate spots: hind wing pale brownish-ochreous, with darker-brown marginal band. Thorax, head, palpi, and legs above dusky ferruginous-brown, grey-speckled; abdomen brownish ochreous, with brown dorsal tufts.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* Dalhousie, N.W. Himalaya. In coll. F. Moore.

--- *APAMEA NUBILA*, n. sp. (Plate XXXVIII. fig. 10.)

*Male and Female.* Fore wing dark purple-brown, washed with chalybeate-grey, crossed by a subbasal, antemedian, postmedian, and a submarginal sinuous black-bordered grey line; orbicular and reniform spots greyish, their interspace and a streak below base of the cell, a mark below the orbicular spot, and a streak above posterior angle black: hind wing and abdomen pale ochreous-brown. Thorax dark purple-brown; palpi and legs ochreous-brown, the latter with black bands.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

## Genus MAMESTRA, Ochs.

## —MAMESTRA CULTA, n. sp.

Fore wing dark purple-brown or plum-colour, suffused with grey, crossed by a subbasal and an antemedian black double zigzag line, an indistinct discal series of black points, a submarginal black-bordered yellow-speckled dentated line, and a marginal row of dentate lunules; orbicular and reniform spots black-bordered; a black lunule below the cell; the posterior end of subbasal line, the lunule below the cell, the posterior end of reniform spot, and the tuft near base of posterior margin streaked with pure yellow: hind wing and abdomen pale greyish purple-brown. Thorax, palpi, and legs dark purple-brown, grey-speckled; a black collar across thorax.

Expanse  $2\frac{1}{2}$  inches.

*Hab.* Dalhousie, N.W. Himalaya. In coll. F. Moore.

## —MAMESTRA STOLICZKÆ.

*Mamestra stoliczkæ*, Felder, Novara Voy. Lep. iv. pl. 109. fig. 32 (1872).

*Male and Female.* Fore wing dusky olive-green, crossed by a subbasal, an antemedian, a postmedian, and a submarginal black-bordered sinuous grey line; discal area and outer margin also grey; orbicular and reniform spots grey- and black-bordered; a black-speckled mark below the cell; three white or pale spots on costal edge before the apex, and a marginal black-pointed lunular line: hind wing cinereous olive-brown, palest at the base. Thorax dusky olive-green, grey- and black-speckled; palpi and legs brown, grey- and black-speckled; legs with pale bands.

Expanse  $1\frac{7}{8}$  inch.

*Hab.* Dalhousie, N.W. Himalaya; Sind valley, Kashmir. In coll. F. Moore.

Nearest to *M. serratilinea*, and quite a distinct species from *M. brassicæ*, which latter also occurs in the N.W. Himalayas.

## Genus PROSPALTA, Walker.

## —PROSPALTA LEUCOSPILA.

*Prospalta leucospila*, Walker, Catal. Lep. Het. B. M. xiii. p. 1114 (1857).

*Female.* Nearest to *P. stellata*. Differs in the fore wing being of a blacker brown, and having the white spots within the cell larger, the central (or orbicular) spot not broken up, the reniform cluster more widely spread, the second cluster below it being obsolete; the costal, discal, exterior margin, and cilia spots are also larger; there is also a distinct white spot below the orbicular, and some spots on middle of posterior margin; cilia of fore wing with two rows of white spots, the cilia of hind wing with one row and an outer border. Thorax, palpi, and legs blackish brown; palpi and legs speckled and banded with white, the thorax with white speckles and a large lower dorsal spot.

Expanse  $1\frac{5}{8}$  inch.

*Hab.* Darjiling. In coll. F. Moore.

Genus *ILATTIA*, Walker.*ILATTIA MONILIS*, n. sp. (Plate XXXVIII. fig. 11.)

Fore wing yellowish ochreous, crossed by a slender indistinct whitish basal, antemedian, and postmedian sinuous bands, a more distinct white submarginal macular band, and a marginal row of black white-bordered dots; some whitish streaks on the costal edge, a prominent white spot at base of the cell, and white bead-bordered orbicular and reniform marks: hind wing pale brownish ochreous, with indistinct transverse narrow discal band and discocellular streak. Thorax and palpi ochreous; abdomen and legs paler, tarsi with brownish bands.

Expanse 1 inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

*ILATTIA CERVINA*, n. sp. (Plate XXXVIII. fig. 12.)

*Male and Female.* Fore wing greyish brown, crossed by an indistinct darker-brown zigzag antemedian and a recurved postmedian line, the latter bordered externally by indistinct brown points; a short subbasal line, and a submarginal pale-bordered fascia; orbicular spot small and circular, ochreous-brown; reniform spot partly ochreous-brown and yellow, bordered with white speckles above and below: hind wing pale greyish brown.

Expanse  $1\frac{1}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

*ILATTIA CALAMISTRATA*, n. sp.

Fore wing golden brown, crossed by an antemedian row of pure white dots, and a postmedian waved double row of white lunular spots; orbicular spot entire and pure white; reniform spot formed by an imperfect white figure of 8; some indistinct white spots on the costal edge, and a very indistinct submarginal dentate white line: hind wing and abdomen pale golden yellow. Head and thorax golden yellow; palpi and legs above blackish.

Expanse 1 inch.

*Hab.* Khasia Hills (*Austen*). In coll. F. Moore.

Genus *CELÆNA*.*CELÆNA SIKKIMENSIS*, n. sp. (Plate XXXVIII. fig. 16.)

*Male.* Fore wing brown, with indistinct black antemedian and postmedian transverse pale-bordered sinuous line, the interspace blackish-streaked; a submarginal series of longitudinal black streaks disposed between the veins and crossed by a whitish-speckled lunular line; orbicular and reniform spots white, the latter most prominent: hind wing paler brown, with paler discal and submarginal fascia. Body brown; palpi ochreous-brown; legs with pale bands.

Expanse  $1\frac{1}{8}$  inch.

*Hab.* Sikkim (*Blanford*). In coll. Dr. Staudinger.

## Fam. CARADRINIDÆ.

## Genus CARADRINA, Ochs.

## CARADRINA ARENACEA, n. sp.

Fore wing pale greyish ochreous, with an indistinct transverse sinuous brown line and three discal lines, the outer line bordered below the apex with ochreous-yellow; reniform spot brownish, speckled with white and ochreous-yellow; a small indistinct brown orbicular spot; some black short streaks on the costa, and a marginal row of dentate points: hind wing whitish ochreous, with pale-brown border. Body whitish ochreous; thorax with a few blackish speckles; palpi blackish laterally, white at tip; fore and middle legs with blackish speckles and tarsal bands.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* Masuri (*Lang*), Darjiling. In coll. F. Moore and Dr. Staudinger.

## CARADRINA DELECTA, n. sp. (Plate XXXVIII. fig. 15.)

Fore wing pale greyish ochreous, with an indistinct black-speckled subbasal and three median transverse sinuous lines, and an outer discal row of points; a submarginal transverse straight pale line; orbicular and reniform spots black-speckled: hind wing ochreous-white. Body ochreous-grey; palpi and legs above brown-speckled.

Expanse  $1\frac{1}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

Allied to *C. kadeni*.

## -DADICA, n. g.

*Male.* Fore wing with straight costa; apex acute; exterior margin short, slightly oblique and convex; posterior margin long; first subcostal branch emitted at one half from the cell, second at one fourth before its end, trifurcate, fifth from end of the cell, curved upward and touching third near its base; cell narrow; discocellular short, concave; radial from upper end of cell; lower radial and upper median branch from angles above end of the cell, second from angle at its end, third at one third before its end. Hind wing short, triangular; cell short; subcostal vein fringed with plumose scales to end of the cell; two subcostal branches from end of the cell; discocellular bent beyond the middle, radial from below the angle; two upper median branches from end of the cell. Body long, somewhat slender, with a large anal tuft; palpi porrect, second joint long, squamose, third joint short; legs pilose beneath; antennæ setose.

Allied to the genus *Radinacra*, Butler, Types of Lep. Het. B. M. ii. p. 26.

## -DADICA LINEOSA, n. sp.

Fore wing brownish ochreous, with a transverse slightly curved subbasal and a discal narrow brown line, a less distinct basal waved line, a median fascia, and a waved submarginal line; a white reniform spot: hind wing pale vinous-brown, with pale ochreous apical

border. Underside as above; lines on fore wing obsolete. Body brownish ochreous, anal tuft brighter ochreous; antennæ and legs above dark brown, with pale ochreous bands.

Expanse  $1\frac{1}{6}$  inch.

*Hab.* Punjab hills. In coll. F. Moore.

#### Genus ACOSMETIA, Stephens.

ACOSMETIA NEBULOSA, n. sp. (Plate XXXVIII. fig. 13.)

Upperside pale ochreous-brown: fore wing darkest, with several transverse indistinctly darker waved narrow fasciæ; some pale spots on costal edge near the apex. Underside paler.

Expanse 1 inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

ACOSMETIA NIGRESCENS, n. sp.

Upperside dark brown: fore wing somewhat greyish brown, with an indistinct black spot in middle of the cell, a streak at its end, a transverse discal waved line, and a broad outer pale band, which is pale-bordered above the posterior angle and is continued along the posterior border: hind wing with blackish-brown outer border. Thorax above blackish brown. Underside uniform brown.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Bombay. In coll. F. Moore.

#### Fam. NOCTUIDÆ.

#### Genus AGROTIS, Ochs.

AGROTIS QUADRISIGNA, n. sp.

*Male and Female.* Fore wing grey, crossed by a black subbasal double sinuous line, an antemedian line, an irregular waved postmedian line, and a submarginal series of ochreous spots, bordered on both sides by a black dentate point, a marginal row of minute black dots, orbicular and reniform marks black-lined, a broad quadrate black dentate mark below the orbicular spot; hind wing and abdomen paler grey, whitish at the base. Thorax, palpi, and legs grey, with black speckles; tarsi with black bands.

Expanse  $1\frac{1}{6}$  inch.

*Hab.* Solun, Punjab; Deyra. In coll. F. Moore.

Allied to *A. labyrinthica*, Staudinger, and to *A. placida*.

AGROTIS COSTIGERA, n. sp.

*Male and Female.* Fore wing dark purple-brown, the basal and discal areas suffused with grey; costal border pale purplish ochreous; a transverse basal, antemedian, and a postmedian sinuous black pale-centred line; orbicular and reniform spots black-lined, dark-centred, and with a pale ochreous inner border, the reniform slightly angled at the upper end of its inner border; an oval black mark below the cell; a pale ochreous submarginal line, with irregular alternate purple-brown and reddish inner border; a marginal row

of distinct black dentate marks ; some pale spots on costa near apex ; hind wing cinereous-brown, palest at the base. Thorax and palpi dark purple-brown, abdomen and legs greyish brown, legs with brown bands.

Expanse, ♂  $1\frac{4}{12}$ , ♀  $1\frac{6}{12}$  inch.

*Hab.* Solun, Punjab ; Cherra Punji, Assam. In coll. F. Moore and Dr. Staudinger.

Allied to *A. christophi*, Staudinger.

—*AGROTIS JUNCTURA*, n. sp.

*Male and Female.* Fore wing pale purplish grey, the median area below the cell pale purplish red ; two subbasal grey-bordered black streaks extending obliquely from within the cell to base of the submedian vein, with blackish lower interspace ; orbicular spot large, outwardly oblique, grey ; reniform spot also large, black-lined, and extending below the cell, centre brown-streaked, interspaces black ; a black conical mark below the orbicular spot ; an indistinct black transverse discal sinuous line and outer row of points ; a marginal greyish-brown fascia terminating before the apex in a black streak ; hind wing pale purplish cinereous. Thorax purple-grey ; collar, front of head, palpi, and legs brown-speckled ; abdomen cinereous-brown, tuft in male ochreous.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Dalhousie, N.W. Himalaya. In coll. F. Moore.

Allied to *A. hastifera*, Donzel.

—*AGROTIS MODESTA*, n. sp.

*Female.* Greyish cream-colour : fore wing with an indistinct black subbasal, antemedian, and a postmedian sinuous double line ; an orbicular and reniform black-lined spot, a short narrow conical mark below the cell, and a marginal row of dots. Body and legs greyish, tarsal bands brown.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Cashmir. In coll. F. Moore.

Nearest allied to, but quite distinct from, *A. aquilina*.

—*TIRACOLA*, n. g.

Fore wing long, narrow, costa slightly arched towards the end, apex acute ; exterior margin oblique, convex, and sinuous ; cell long ; first subcostal branch emitted at half length of the cell, second at three fourths its length, trifurcate, third emitted at one third beyond base of the second, and fourth at about one half from base of second, fifth from end of the cell and touching the third near its base ; discocellular deeply concave, upper radial from angle close to upper end of the cell, lower radial from angle near lower end of the cell ; upper median from angle above and middle median from end of the cell, third at one third before its end ; submedian concave near its base. Hind wing triangular, apex convex ; exterior margin oblique, recurved, slightly sinuous ; cell short ; two subcostal branches from end of cell ; discocellular very slender, angled inward in the middle, a

slender radial from the angle; two upper median branches from lower end of the cell, third branch at half before its end. Body stout, abdomen long; palpi short, ascending, compactly clothed, second joint thick, third joint short; legs compactly pilose above; antennæ setose. Type *T. plagiata*.

*TIRACOLA PLAGIATA.*

*Agrotis plagiata*, Walker, Catal. Lep. Het. B. M. xi. p. 740 (1857).

*Agrotis plagifera*, Walker, *l. c.* p. 741.

*Hab.* Ceylon, S. India, Darjiling.

*TIRACOLA SPECTABILIS.*

*Agrotis spectabilis*, Walker, Catal. Lep. Het. B. M. xxxii. p. 704 (1865).

*Hab.* Australia.

Genus *GRAPHIPHORA*, Ochs.

— *GRAPHIPHORA FLAVIRENA*, n. sp. (Plate XXXVIII. fig. 3.)

Allied to *G. neglecta*, Hübner. Fore wing dark ferruginous, crossed by an indistinct brown-bordered, pale, waved antemedian and a postmedian line, a median brown fascia angled at lower end of the cell; orbicular spot obsolete; reniform spot narrow, yellowish, and dusky at its lower end: hind wing ferruginous-brown. Body and legs ferruginous.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

— *GRAPHIPHORA NIGROSIGNA*, n. sp. (Plate XXXVIII. fig. 4.)

Fore wing brown-ochreous, crossed by indistinct basal, antemedian, and postmedian zigzag brown duplex lines, and a waved submarginal pale line; veins across the disk with indistinct black-pointed pale spots; orbicular and reniform marks paler, with brown border, lower lobe of reniform dusky; a prominent black triangular spot below the orbicular mark: hind wing and abdomen pale brownish ochreous. Thorax ochreous; second joint of palpi at the side and legs above dark brown, third joint of palpi and tip of second ochreous.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Tonglo, Sikkim. In coll. Dr. Staudinger.

Genus *MEGASEMA*<sup>1</sup>, Hübner.

— *MEGASEMA CINNAMOMEA*, n. sp. (Plate XXXVIII. fig. 6.)

Fore wing dull cinnamon-brown, with an indistinct darker basal, subbasal, and a discal transverse sinuous line; a more distinct outer discal pale-bordered irregular line; a large pale-bordered orbicular and reniform spots, their interspace within the cell, and a transverse

<sup>1</sup> Type *M. triangulum*, Hufn.



median fascia darker brown; outer margin also darker brown, with a pale-bordered lunular line: hind wing paler. Underside pale, brighter cinnamon-brown. Thorax, head, palpi, and legs above dark cinnamon-brown.

Expanse  $1\frac{7}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

#### Genus OCHROPLEURA, Hübner.

##### —OCHROPLEURA CONSANGUINEA, n. sp.

*Male and Female.* Fore wing dark cupreous-brown, base and exterior border suffused with grey; costal border pale ferruginous; a short subbasal pale streak with black border, an oblique antemedian waved black double line, a postmedian, less distinct, double sinuous line, and a submarginal pale lunular line; orbicular and reniform spots grey, with black interspaces; an indistinct conical greyish-centred mark below the cell: hind wing brown. Thorax cupreous-brown; collar and palpi ferruginous edged with black; abdomen brown; legs blackish with pale bands.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* Solun, Punjab; Dalhousie, N.W. Himalaya. In coll. F. Moore.

Allied to *O. renalis*, from which it is distinguishable by its smaller size, straighter and more oblique antemedian line, and the postmedian line being nearer the renal spot.

#### Genus HERMONASSA, Walker.

##### —HERMONASSA CHALYBEATA, n. sp. (Plate XXXVIII. fig. 17.)

Smaller than *H. consignata*. Fore wing dark brown, with indistinctly darker markings, which are all bordered with chalybeous-grey speckles: hind wing pale cinereous-brown. Underside cinereous-brown.

Expanse 1 inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

##### —HERMONASSA SINUATA, n. sp. (Plate XXXVIII. fig. 5.)

Near *H. cuprina*. Fore wing paler and of a brighter cupreous-brown, the interspace between the transverse basal and subbasal lines wider, the latter more acutely sinuous, and its lower end almost touching that of the discal line, which latter is also more sinuous: hind wing very pale brown. Underside also much paler.

Expanse  $1\frac{5}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

#### Fam. ORTHOSIIDÆ.

#### Genus ORTHOSIA, Ochs.

##### —ORTHOSIA RECTIVITTA, n. sp.

Fore wing mottled with greyish ochreous and dark brown, posterior and exterior areas more uniformly brown; a transverse sinuous

antemedian and a straight postmedian pale line with black-speckled borders; a submarginal zigzag pale-bordered black-speckled fascia; orbicular and reniform spots pale, with black-speckled border; a marginal row of black dots: hind wing brown; cilia pale ochreous-brown. Thorax, and head grey-speckled; palpi with broad brown lateral band; legs dark brown, with ochreous speckles and tarsal bands.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Darjiling (*Russell*). In coll. F. Moore and Dr. Staudinger.

Fam. COSMIIDÆ.

Genus COSMIA, Ochs. .

—COSMIA HYPENOIDES, n. sp. (Plate XXXVIII. fig. 19.)

*Male and Female.* Fore wing dark purple-brown, crossed by an outwardly oblique antemedian, a median, and an outwardly-angled postmedian transverse pale-bordered black line, a black dot at base of cell, a submarginal indistinct lunular line, and a marginal black line; orbicular and reniform spots very indistinct: hind wing and abdomen dull brown. Thorax purple-brown; palpi grey, with broad black band on second joint; fore and middle legs with blackish bands.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Parasnath Hill (Bengal). In coll. Dr. Staudinger.

Fam. HADENIDÆ.

Genus DIANTHECIA, Boisdu.

—DIANTHECIA CONFLUENS, n. sp. (Plate XXXVIII. fig. 20.)

Fore wing dark purple-brown, crossed by a subbasal black-bordered pale-ochreous sinuous line, a similar antemedian and a postmedian narrow waved line, and a submarginal brown-bordered pale line; orbicular and reniform spots pale ochreous with brown centre; the two lower median branches pale ochreous to the postmedian line; a black dentate mark below the cell; a marginal row of dentate lunules; cilia brown: hind wing greyish dusky-brown, palest at base, and with a pale-bordered brown transverse discal line; cilia ochreous. Body and legs dark purple-brown, black-speckled.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

Genus EUPLEXIA, Stephens.

—EUPLEXIA DISTORTA, n. sp. (Plate XXXVIII. fig. 18.)

*Male and Female.* Fore wing black, with transverse distorted white bands, including an outer marginal sinuous bordered band: hind wing pale blackish-cinereous externally and whitish basally; cilia white. Thorax black, with white tegulæ, crest, and collar; abdomen blackish at tip; palpi black tipped with white; legs black, with white streaks and tarsal bands.

Expanse  $1\frac{3}{8}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

## Genus TRIGONOPHORA, Hübn.

## --TRIGONOPHORA ALBOSIGNATA, n. sp.

Fore wing reddish ochreous, minutely speckled with purplish grey, crossed by an inwardly-oblique antemedian ochreous-white straight narrow band, a postmedian outwardly-oblique, sinuous, narrow band, both bands with indistinctly darker purple-red border; a submarginal zigzag pale-bordered denticulated red fascia; cilia purple-brown; orbicular and reniform marks formed by a purple-red line, the centre being yellowish ochreous, the reniform mark bordered externally by two upper and two lower white spots; hind wing purplish ochreous-brown, palest along the costal border. Thorax, palpi, and legs reddish-ochreous, abdomen ochreous-brown.

Expanse  $1\frac{7}{8}$  inch.

Allied to *T. empyrea*, Hübn., of Europe.

*Hab.* Kussowlie, N.W. Himalaya. In coll. F. Moore.

## --APPANA, n. g.

Fore wing somewhat short, costa straight, apex slightly pointed, exterior margin oblique, very slightly waved and convex; first subcostal branch emitted from half length of the cell, second at one fourth, trifurcate, third at one fourth, and fourth at one half from base of second, fifth from end of the cell, projecting upward and touching the third near its base; cell long; upper discocellular very short, lower bent in the middle; upper radial from angle near subcostal, lower radial and upper median from angles immediately above end of the cell, middle median from its end, lower median from one third before its end; submedian slightly recurved. Hind wing triangular, exterior margin convexly oblique and waved; two subcostal branches emitted from a short distance beyond end of the cell; discocellular obliquely concave, radial from near its lower end; two upper median branches from end of cell; submedian and internal veins long. Body moderate, abdomen extending beyond hind wing; palpi short, stout, squamose, third joint very short; antennæ setose; legs pilose beneath.

Allied to *Habryntis* (*H. scita*, Hübner).

## --APPANA INDICA, n. sp.

*Phlogophora indica*, Moore, P. Z. S. 1867, p. 57.

Fore wing pale purplish ochreous, with a median transverse broad band of chestnut-brown, palest on the costa, and enclosing a paler orbicular and reniform spots, which are confluent below the cell; the band is narrow hindward and bordered on both sides by a narrow black line; two black-speckled transverse streaks and a contiguous black spot at base of the wing; a pale-yellow submarginal line; veins speckled with black and white: hind wing paler, with an indistinct darker discal and marginal bands. Thorax chestnut-brown, with white-fringed collar, abdomen paler; palpi and legs ochreous-brown.

Expanse  $1\frac{4}{10}$  inch.

*Hab.* Darjiling. In coll. F. Moore and Dr. Staudinger.

—Genus *BERRHÆA*.

*Berrhæa*, Walker, Catal. Lep. Het. B. M. xv. p. 1721 (1858).

Wings rather narrow; fore wing elongated, costa straight; apex slightly pointed; exterior margin oblique, scalloped; posterior margin recurved; costal vein extending to two thirds the margin, first subcostal branch emitted at half length of the cell, second trifurcate, emitted at one fourth before end of the cell, third at one fourth, and fourth at one half from base of second, fifth from end of the cell, curving upward and touching third near its base; discocellular slightly angled close to each end, deeply concave in middle, radials from its upper and lower angle; cell long, narrow; two upper median branches from angles at end of the cell, lower at one fourth before the end; submedian recurved: hind wing long, exterior margin convex, waved; abdominal margin short; costal vein extending to apex; two subcostal branches from end of the cell; discocellular obliquely concave, radial from near its lower end; two upper median branches from end of the cell, lower at one third before its end; submedian and internal veins straight. Body stout, abdomen extending beyond hind wing; palpi stout, broad, ascending, densely clothed with long scales, third joint short, squamose; legs densely pilose; antennæ very minutely pectinate in male.

Allied to *Trachea* (*T. atriplicis*).

—*BERRHÆA AURIGERA*.

*Berrhæa aurigera*, Walker, Catal. Lep. Het. B. M. xv. p. 1721 (1858).

Fore wing ochreous-brown, crossed by a pale ochreous, duplex, black-bordered zigzag antemedian line and a sinuous postmedian line; some black-bordered ochreous basal streaks, others on the costal border and middle of posterior border; a submarginal zigzag interrupted ochreous and brown fascia; a black marginal lunular line; orbicular and reniform marks ochreous, large and widely separated at their anterior ends, but joined by a lower streak, which extends below the cell and runs into a whitish ochreous quadrate spot: hind wing æneous-brown, the base being whitish cinereous. Thorax ochreous-brown; abdomen cinereous-brown; palpi brown; legs brown, with ochreous tarsal bands.

Expanse, ♂  $1\frac{7}{8}$ , ♀ 2 inches.

*Hab.* Darjiling (*Atkinson*). In coll. Dr. Staudinger.

—*BERRHÆA MEGASTIGMA*.

*Hadena megastigma*, Walker, Cat. Lep. Het. B. M. xxxiii. p. 738 (1865).

*Hab.* Darjiling.

—*BERRHÆA ALBINOTA*.

*Hadena albinota*, Moore, P. Z. S. 1867, p. 58.

*Hab.* Darjiling.

—*BERRHÆA OLIVACEA*, n. sp.

Allied to *B. megastigma*; comparatively smaller: fore wing similarly marked, but with less prominent ochreous and black streaks, the submarginal zigzag ochreous line slender throughout its length, the orbicular and reniform marks slightly smaller: hind wing cupreous-brown, slightly paler at the base.

Expanse, ♂  $1\frac{3}{8}$ , ♀  $1\frac{6}{8}$  inch.

*Hab.* Darjiling. In coll. F. Moore and Dr. Staudinger.

Genus *HADENA*, Treits.

—*HADENA ADJUNCTA*, n. sp.

Fore wing purplish grey, crossed by a greyish-white-bordered, black, sinuous antemedian and a postmedian line, and a submarginal row of long black-bordered, grey, dentate marks; a marginal black lunular line; orbicular and reniform spots black-lined; a black zigzag streak at base of wing, and a distinct black forked bar below the cell joining the ante- and postmedian lines, below which the area is iron-grey: hind wing and abdomen pale brown. Thorax purple-grey, black- and white-speckled; first and second joints of palpi brown- and grey-speckled, third joint ochreous; legs brown, grey-speckled, and with ochreous tarsal bands.

Expanse  $1\frac{7}{8}$  inch.

*Hab.* Dalhousie, N.W. Himalaya. In coll. F. Moore.

Near to the European *H. satura*.

—*HADENA SIDERIFERA*, n. sp.

Fore wing brownish grey, crossed by a basal, antemedian, and a postmedian double zigzag black line, a submarginal sinuous pale yellowish line with black inner points, and a marginal row of minute black points; orbicular spot black-lined; reniform spot composed of a large white quadrate spot, bordered at the upper and lower outer ends by two minute white spots, and on the inner side by a black pale-bordered line; a quadrate black mark below the orbicular spot: hind wing greyish brown.

Expanse  $1\frac{5}{8}$  inch.

*Hab.* Solun, Punjab. In coll. F. Moore.

Allied to *H. albiflexura*, Walker, and to *H. constellata*, Moore, from Darjiling. It also has much the appearance of *Mamestra brassicæ*.

Fam. XYLINIDÆ.

Genus *CUCULLIA*, Ochs.

—*CUCULLIA ALBESCENS*, n. sp.

A smaller species than *C. atkinsoni*; fore wing paler brown, the grey more diffused through the middle of the wing: hind wing cinereous-white, with a very faint brownish marginal border. Underside much paler than *C. atkinsoni*, the hind wing almost uniformly white. Body greyer; legs grey above.

Expanse  $1\frac{5}{8}$  inch.

*Hab.* Dalhousie, N.W. Himalaya. In coll. F. Moore.

Genus *CALLÆNIA*, Hübner.*Cucullia* (part.) auctorum.— *CALLÆNIA PULLATA*, n. sp.

Fore wing grey; veins black, with a transverse very indistinct black antemedian and a postmedian zigzag line, some slender longitudinal streaks near the outer margin, and a lunular black marginal line; an indistinct orbicular and reniform black-lined mark, the latter extending below end of the cell: hind wing white, with a broad black outer marginal band and a discocellular spot; costal and subcostal veins lined with black; cilia white. Thorax, head, palpi, and legs above grey; abdomen black, with grey tip; a slender black collar on front of thorax.

Expanse  $2\frac{3}{4}$  inches.

*Hab.* Dalhousie, N.W. Himalaya. In coll. F. Moore.

Genus *CALOPHASIA*, Stephens.— *CALOPHASIA CASHMIRENSIS*, n. sp.

Fore wing pale whitish ochreous, with a pale yellowish-ochreous median transverse band, bordered on both sides by an indistinct black sinuous double line, and medianly traversed below the cell by a more distinct black lunular fascia; costal border blackish; orbicular and reniform marks blackish, and lined with pale ochreous; base of wing black-speckled, and longitudinally streaked near posterior margin; some black dentate discal marks, a patch above posterior angle, and a marginal row of white-bordered black points: hind wing dusky white, with a very pale dusky black border, and a distinct black lunular marginal line. Body pale ochreous, palpi and legs black-speckled; legs with black tarsal bands.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Changas, Cashmir. In coll. Dr. Staudinger.

Near to the European *C. linariæ*, Fabr.

— *CALOPHASIA LOBIFERA*, n. sp.

Fore wing greenish brown, with a pale pinkish-ochreous fascia extending from base through the cell to the apex, a slender black transverse subbasal irregular line, which is deeply indented outward below the cell and forms a lobate spot, and a discal irregular waved line, both with a brown outer border, the interspace below the cell dusky grey; veins black, with pale margins and intervening black streak terminating in a white ciliary point; some black streaks on costa near base, and white streaks towards the apex; an indistinct orbicular and reniform brown-lined mark, both centred with brown; a short oblique, double, basal brown line below the cell: hind wing greyish brown; cilia white. Body pale ochreous, thorax grey-speckled; palpi and legs above brown, with ochreous bands.

Expanse  $1\frac{2}{10}$  inch.

*Hab.* Bombay. In coll. F. Moore.

## Fam. HAMEROSIDÆ.

## Genus APSARASA, Moore.

## APSARASA WALLACEI, n. sp.

*Female.* Glossy purplish black. Differs from *A. radians* from Sikkim, and *A. figurata* from Andamans, in having the marginal spots alternately obsolete on the costa, a broader intervening space between those on the outer margin, and a much larger quadrate spot on middle of hind margin. Underside of fore wing as above, hind wing without basal spots. Abdomen black above, small lateral spots and streak beneath white.

Expanse  $2\frac{7}{8}$  inches.

*Hab.* Dorey (*Wallace*). In coll. Oxford University Museum.

## Fam. ACONTIIDÆ.

## -NARANGA, n. g.

Wings small: fore wing elongated, narrow, acute at the apex, exterior margin oblique; hind wing slightly elongated and narrow. Veins similar to those in *Xanthodes*. Palpi small, smooth, slightly ascending, third joint minute, slender, short; legs slender, smooth. Type *N. diffusa*.

## -NARANGA DIFFUSA.

*Xanthodes diffusa*, Walker, Cat. Lep. Het. B. M. xxxiii. Suppl. p. 779 (1865).

Fore wing yellow, with a slight median, oblique, short purplish-red band, a less distinct streak below the apex, and a spot above posterior angle: hind wing whitish yellow. Body, palpi, and legs above yellow.

Expanse  $\frac{7}{8}$  inch.

*Hab.* Ceylon; S. India (Nilgiris); Formosa.

## NARANGA ÆNESCENS, n. sp.

Fore wing ænescent yellow, with two narrow purple-brown outer bands: hind wing brown; cilia yellow. Body and legs yellow.

Expanse  $1\frac{8}{12}$  inch.

*Hab.* Formosa (*Swinhoe*). In coll. F. Moore.

## -CHURIA, n. g.

Fore wing elongated, narrow, rectangular; costal vein extending to two thirds the margin; first subcostal emitted at one half and second at one eighth before end of the cell, second trifurcate, third and fourth at equal distances from base of second, fifth from end of the cell and slightly touching third at its base; discocellular bent at its upper and lower end, and very convex in the middle, radials from the angles; upper median branch from end of the cell, middle branch from one eighth and lower from beyond one third before end of the cell; submedian slightly curved at the base. Hind wing short; costal vein straight, extending to apex; two subcostal branches from end

of the cell; discocellular obliquely concave; radial from its lower end immediately above angle of the cell; two upper median branches from beyond end of the cell, lower from one third before the end; submedian and internal veins straight. Body stout, abdomen long; palpi porrect, second joint laterally broad at the tip, clothed with coarse lax scales, third joint short, thick, half the length of the second; legs stout, squamose; antennæ setose. Type *C. nigrisigna*.

*CHURIA NIGRISIGNA*, n. sp. (Plate XXXVII. fig. 13.)

*Male and Female.* Upperside pale brownish ochreous; fore wing with a small black spot on middle of the discocellular veinlet; cilia ochreous-white: underside paler along the posterior border of fore wing and on the hind wing. Palpi and legs above pale brownish ochreous.

Expanse, ♂  $\frac{9}{10}$ , ♀  $1\frac{1}{10}$  inch.

*Hab.* Calcutta. In coll. Dr. Staudinger.

—*CHURIA OCHRACEA*, n. sp.

*Male.* Upperside paler ochreous than in *C. nigrisigna*; no black spot on the fore wing: underside pale ochreous; thorax, palpi, and legs above ochreous.

Expanse  $\frac{8}{10}$  inch.

*Hab.* Calcutta. In coll. Dr. Staudinger.

—*CHURIA MACULATA*, n. sp.

*Male.* Upperside pale brownish ochreous; cilia ochreous-white; fore wing with a small black spot on middle of discocellular veinlet, and three equidistant spots on the submarginal border. Underside paler ochreous, palest along posterior border of fore wing and on the hind wing. Palpi and legs above brownish ochreous.

Expanse  $\frac{1}{2}$  inch.

*Hab.* Ceylon. In coll. F. M. Mackwood.

#### Fam. HELIOTHIDÆ.

This family should be ranged between the Acontiidæ and Anthophilidæ, the genera comprised in it having closer affinity with those families than with the Xylinidæ.

A prominent character in the species of Heliothidæ, not present, so far as I know, in any other group, is that the tibiæ of the front legs are armed with spines, thus giving them the appearance of miniature crabs' claws<sup>1</sup>.

In *Heliothis dipsacea*, *H. aduncta*, Butler (a Chinese species), *H. maritima*, *H. ononidas*, *H. armigera*, and *H. peltigera* the fore tibia is long, narrow, and armed with two slender spines in front, as well as possessing other shorter spines on each side. In *H. incarnata*, which is generically distinct from the above-mentioned species, the tibia is shorter and stouter, and is armed only with two

<sup>1</sup> Since writing the above, I find that *Petasia*, a genus of Notodontidæ, is similarly armed. Both *P. cassinea* and *P. nubeculosa* have a single stout terminal spine on the outer end of the tibia.



stout black terminal front spines; the palpi are stouter and have the terminal joint hairy; the fore wing is less triangular in form, and the hind wing shorter than in typical *Heliothis*. For this species (*incarnata*) I propose the generic name of *Chazaria*.

The species described by Walker as *H. lucilinea* (Cat. Lep. Het. B. M. xv. p. 1749), from St. Domingo, is also generically distinct from the above; the *Periphanes delphinii* and *Oria sanguinea* (a North-American species) have a very short stoutish tibia armed with two terminal stout spines, this character also occurring less stoutly in the European *Anthæcia pulchra*, *A. cardui*, *A. cognata*, *A. cora*, *A. lynx* (a North-American species), and in *A. dorsilutea*, the locality of which is unknown.

In *Melicleptria scutosa* (Europe) and *M. speciosa* (N. America) the tibia is more slender and delicately spined than in *Heliothis*, the tarsus also being more delicate and comparatively longer.

In *Ædophron phlebophora* and *Stephania puniceago* the terminal spines of the tibia are short, and the basal joint of the tarsus, also, is laterally spined.

In this family (Heliothidæ) should also be placed:—the American genus *Derrima* (*D. stellata*, Walk. Cat. Lep. Het. xii. p. 770, and *D. henrietta*, Grote), arranged hitherto in the Hamerosidæ; the *Anthophila lineata* and *A. divergens* of Walker's Cat. xii. p. 830, of unknown locality and which are quite distinct from typical *Anthophila*; and the *Microphysa contracta* (Walker, Cat. Lep. Het. xii. p. 836), which is also generically distinct from *Microphysa*.

The insect described as *Chariclea taurica*, and assigned to that genus in European catalogues, is quite distinct from typical *Chariclea* (*Periphanes delphinii*), differing from it in not possessing the tibial spines, and having, moreover, very short tarsi. It should be arranged with the Anthophilidæ, under the generic name of *Philarreta*; in the Anthophilidæ should also be placed the genus *Pyrria* (*P. marginata* and *P. purpuritis*),—these species agreeing better in their tibial and tarsal characters than with the Heliothidæ.

### Genus HELIOTHIS, Hübner.

#### —HELIOTHIS PERIGEOIDES, n. sp.

*Male*. Fore wing pale ochreous-yellow, crossed by two subbasal ochreous-brown pale-bordered zigzag lines; a median sinuous fascia, and a discal white-pointed sinuous line, bordered by an outer brownish waved fascia; a pale-bordered orbicular and a reniform spot, the latter with grey centre; some whitish spots on the costal edge, and an outer marginal row of distinct black dots: hind wing ochreous-white, with an ochreous-brown marginal band enclosing a central white patch. Underside ochreous-white, with dusky-brown markings as in *H. peltigera*, but paler, and the discal fascia on both wings interrupted.

Expanse 1 to  $1\frac{1}{2}$  inch.

*Hab.* Kutch, N.W. India. In coll. F. Moore.

Near to *H. peltigera*, which also occurs in Kutch, but is a much smaller and differently marked insect.

—*HELIOTHIS SUCCINEA*, n. sp.

*Male and Female.* Ochreous-yellow: fore wing crossed by two subbasal brown zigzag lines, an outwardly-waved median line, a lunular discal line, and a sinuous submarginal line, with indistinct paler intervening lines, the space between the discal lunular line and the submarginal line dusky ochreous-brown: hind wing with an ochreous-black marginal band enclosing a pale yellow central spot. Underside with dusky markings similar to those in *H. armigera*. Thorax greenish ochreous; abdomen, palpi, and legs yellowish ochreous.

Expanse, ♂ 1 inch, ♀  $1\frac{1}{8}$ .

*Hab.* Bombay (*Dr. Leith*). In coll. F. Moore.

This is allied to *H. armigera*, but is smaller and differently coloured; the fore-wing markings also differ.

—*RAGHUA*, n. g.

Fore wing short, narrow; costa slightly arched at the base and with a swollen protuberance on its middle; exterior margin oblique and convex; costal veins recurved; subcostal recurved before end of the cell, first branch recurved towards the costa, emitted at half length of the cell, second branch emitted before end of cell, trifurcate, third from near its base, fourth at one half its length, fifth from end of the cell, curved upward, and touching third near its base; discocellular bent near each end, radials from the angles; two upper median branches from angles at end of the cell, lower at some distance before the end. Hind wing short; two subcostal branches emitted beyond end of the cell; discocellular concave, very slender, a slender radial from its middle, two upper median branches from end of the cell, lower from near its end. Body extending beyond hind wing; palpi slender, apex short; legs slender, femora slightly pilose beneath, fore tibia in male armed with two terminal spines in front; antennæ setose.

—*RAGHUA CONFERTISSIMA*.

*Leucania confertissima*, Walker, Cat. Lep. Het. B. M. xxxii. p. 625 (1865).

*Hab.* S. India.

—*SOPHAGA*, n. g.

Allied to *Dorika*. Wings longer and comparatively broader; fore wing with straighter costa and shorter posterior margin; first subcostal moderately long, second emitted immediately before end of the cell, third trifurcate, emitted at end of the cell, and anastomosing with second very close to its base for a short distance, fourth and fifth short; upper discocellular very short, lower very slender and deeply concave; radials from angle of upper and near end of lower, two upper median branches from angles at end of the cell, lower from near the end. Hind wing with two subcostal branches emitted at one fourth beyond end of the cell; discocellular bent in the middle; radial from its angle; two upper median branches from

end of the cell, lower from distance before the end. Body long; palpi short; legs very hairy beneath; male with fore tibia furnished with a pair of terminal front spines; antennæ setose.

Type *S. sinuata*.

—*SOPHAGA SINUATA*, n. sp.

*Male and Female.* Fore wing pale yellow, with a broad transverse dark ochreous-yellow median band, its inner border being bent below the cell, its outer border sinuous and with a brown point on each of the veins from the radial; a dark ochreous streak from the band, along median vein, to the base; exterior border with short longitudinal dark ochreous streaks, and a marginal row of black dots: hind wing pale greyish ochreous, the discal area brownish. Underside paler; fore wing with the discal area and a marginal row of black dots: hind wing in male with a narrow discal transverse brownish band, indistinct discocellular spot, and speckles along outer border, obsolete in female. Thorax dark ochreous; abdomen brownish ochreous; terminal spines on fore tibia black.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Bombay (*Dr. Leith*). In coll. F. Moore.

—*DORIKA*, n. g.

Fore wing short, narrow; costa slightly arched from the base, exterior margin oblique, convex; first subcostal branch somewhat short, second emitted from beyond end of the cell, quadrid, third from close to base of second, fourth and fifth on a foot-stalk near apex; cell long, narrow; upper discocellular very short, lower slender, concave, bent slightly near median; radials from their angles; upper median branch from angle above end of the cell, middle branch from the end, lower at some distance before the end and opposite first subcostal: hind wing convex at the apex, exterior margin recurved, abdominal margin short; two subcostal branches emitted from beyond end of the cell; discocellular very slender, radial from the middle; two upper median branches from end of the cell, lower from near its end. Body short; palpi slender, pilose; legs pilose beneath; fore tibia in male armed in front with a long and a short spur; antennæ setose.

Type *D. sanguinolenta*.

—*DORIKA SANGUINOLENTA*, n. sp.

*Female.* Fore wing bright yellow; costal edge white; longitudinally streaked with red along costal border, the median veins, and submedian vein; cilia pinky white; hind wing white. Thorax, palpi, and legs above ochreous-red; abdomen brownish ochreous.

Expanse  $1\frac{2}{3}$  inch.

*Hab.* Bombay (*Dr. Leith*). In coll. F. Moore.

—*DORIKA AUREOLA*.

*Leucania aureola*, Walker, Cat. Lep. Het. B. M. ix. p. 108 (1856).

*Hab.* Canara, S. India.

—MASALIA, n. g.

Wings small: fore wing short, narrow; costal vein running close to the margin; first subcostal branch short, emitted at one fourth before end of the cell, second at equal distance between first and fifth, trifid, the third and fourth at about one half from base of second, fifth from end of the cell, ascending and touching the second at halfway between its base and third; upper discocellular straight, short, lower concave, bent near lower end, radials from the angles; upper median branch from angle above end of the cell, middle branch from the end, lower from opposite first subcostal. Hind wing small, exterior margin convex; two subcostal branches from end of the cell; discocellular bent in the middle, radial from the angle; cell short; two upper median branches from end of the cell. Body moderately slender; palpi minute, slender, porrect; antennæ filiform; fore tibia armed with a pair of terminal spines.

Type *M. radiata*.

—MASALIA RADIATA, n. sp.

Fore wing greyish ochreous-brown, with a pale yellow longitudinal narrow streak from base of the cell to outer margin; a short basal streak below it between the median and submedian veins, and a narrower streak extending along and between the subcostal and median veins; costal edge yellow; cilia pale pinkish grey: hind wing greyish brown. Underside greyish brown; fore wing with white streaks disposed as on upperside. Thorax, head, palpi, and legs above ochreous-brown; terminal spines on fore tibia black; abdomen ochreous; eyes black.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Manpuri, N.W. India (*Horne*). In coll. F. Moore.

—MASALIA IRRORATA, n. sp.

*Female.* Fore wing pale reddish ochreous, with paler streaks between the veins, speckled with minute dark-brown scales, which are most numerous along the area of the veins and on posterior border; an oblique transverse discal series of six black points, one on each lower vein; cilia bordered with white: hind wing white; cilia white. Underside very pale ochreous-white; fore wing with the costal border tinged with red; median veins brown-speckled. Thorax pale reddish ochreous; front of head, palpi, and legs above brownish ochreous.

Expanse  $1\frac{5}{7}$  inch.

*Hab.* Darjiling. In coll. F. Moore.

—PRADATTA, n. g.

Fore wing comparatively short and broad; costa slightly depressed in the middle, exterior margin oblique, posterior margin convex near the base; cell long; first subcostal branch rather short, second emitted from near end of the cell, trifurcate, third and fourth close together, fifth curved abruptly upward from end of the cell and

anastomosed to third near its base; discocellular very slender, bent close to each end, concave in middle, upper and lower radials from the angles; upper median branch emitted from angle above end of the cell, middle branch from the end, lower from some distance before the end. Hind wing comparatively long and narrow; two subcostal branches from end of the cell; discocellular bent in middle, a very slender radial from the middle; cell long; two upper median branches from end of the cell, lower from some distance before the end. Body long, slender; thorax laxly pilose; palpi pilose, small, apex very short; legs slightly pilose beneath; fore tibia in male armed with a long and a short black spine in front; antennæ in male minutely pectinate.

Type *P. beatrix*.

—PRADATTA BEATRIX, n. sp.

*Synia beatrix*, Von M. D. R., MS.

*Male and Female.* Fore wing pale pink, with a longitudinal pale yellow fascia extending from the base of the cell to exterior margin, and a similar fascia below the cell spreading below the median vein to the outer margin; some specimens have the median vein to end of the cell tinged with black: hind wing white, with pink lining to the veins and outer border. Underside—fore wing with paler costal and outer border than above; hind wing with pink costal border. Thorax pinkish brown, palest on tegulæ; abdomen pale yellowish above, pinkish beneath; palpi and legs above ochreous-red; fore-tibial claws black.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Canara (S. India); Dharmasala (N.W. Himalaya); Saibabad (Cashmir). In coll. F. Moore, Dr. Staudinger, and Lord Walsingham.

—PRADATTA BIVITTATA.

*Leucania bivittata*, Walker, Catal. Lep. Het. B. M. ix. p. 108 (1856).

*Hab.* S. India. In coll. British Museum.

—PRADATTA DECORATA, n. sp.

*Male and Female.* Fore wing pale yellow, with a broad triangular pale crimson band extending from base through and below the cell and thence obliquely upward across the disk to the apex; a recurved series of six white spots on the discal portion of the band, one on middle of median vein, and one on submedian vein; cilia crimson: hind wing paler yellow; cilia whitish, slightly tinged with crimson at the apex. Body pale yellow; thorax ochreous; front of head, tip of palpi, and legs above crimson; fore-tibial claws black.

Expanse  $\frac{3}{4}$  to 1 inch.

*Hab.* Deccan (*Dr. Day*); Manpuri, N.W. Provinces (*Horne*); Allahabad (*Hellard*); Sind valley and Saidabad, Cashmir (*Atkinson*). In coll. F. Moore and Dr. Staudinger.

## -PRADATTA ARTAXOÏDES, n. sp.

*Male and Female.* Fore wing uniformly ochreous-yellow; hind wing brownish-ochreous, darkest externally; cilia yellow. Underside paler; basal and discal area of fore wing brownish ochreous. Tip and side of palpi and fore legs above brownish.

Expanse, ♂  $\frac{9}{10}$ , ♀ 1 inch.

*Hab.* N.W. Himalaya; Cashmir. In coll. F. Moore.

## -PRADATTA MODESTA, n. sp.

*Female.* Fore wing pale ochreous-yellow; hind wing ochreous-white. Underside of fore wing with a greyish-brown discocellular patch. Body, palpi, and legs pale ochreous-yellow; fore tibial claws black.

Expanse  $\frac{9}{10}$  inch.

*Hab.* Manpuri, N.W. India (*Horne*). In coll. F. Moore.

## -CURUBASA, n. g.

*Male and Female.* Fore wing elongated, narrow, costa arched at the base, apex somewhat acute; exterior margin oblique, even, slightly convex hindward and at the angle; cell long; costal vein recurved towards its end; first subcostal branch emitted beyond half length of the cell, second immediately before end of the cell, trifid, the third and fourth at one third from its base; fifth from end of the cell, ascending and touching the second close to end of the third; discocellular bent near upper and lower end, slender, concave in middle, radials from the angles; upper median branch from angle above end of the cell, middle branch from the end, lower at one fourth before the end. Hind wing broad, apex convex, exterior margin waved; two subcostal branches emitted from end of the cell; discocellular slender, bent in the middle, radial from the middle; cell short; two upper median branches from end of the cell. Body moderately stout; palpi short, slender, porrect; femora and tibiae slightly pilose above; fore tibia short, thick, and armed with two terminal black spines; antennae filiform.

Type *C. lanceolata*.

## -CURUBASA LANCEOLATA.

*Alaria lanceolata*, Walker, Catal. Lep. Het. B. M. xxxiii. p. 767 (1865).

Fore wing pale silky-yellow, with a purplish-pink costal band which extends halfway across and through the cell to below the apex; a similar band above the posterior border: hind wing whitish; thorax, head, palpi, and legs above purplish pink; terminal spines on fore tibia black; abdomen yellow.

Expanse  $1\frac{1}{8}$  inch.

*Hab.* Nilgiris (S. India). In coll. British Museum and F. Moore.

—*CURUBASA CRUENTATA*, n. sp.

*Male and Female.* Fore wing pale silky yellow, with a purplish-pink costal band extending only to the subcostal vein, a similar but broader and darker band along the posterior margin; cilia yellow, edged with pale pink: hind wing paler yellow. Thorax and front of head ochreous-brown; abdomen yellow; palpi and legs above reddish ochreous; terminal spines on fore tibia black.

Expanse, ♂ 1, ♀  $1\frac{2}{8}$  inch.

*Hab.* N.W. India; Noashera, Cashmir. In coll. F. Moore and Dr. Staudinger.

—*CURUBASA CALAMARIA*, n. sp.

*Male.* Very pale straw-yellow; fore wing with a very indistinct longitudinal roseate streak through the median vein. Underside as above; basal and discal areas, including the costa of fore wing, greyish brown. Thorax, front of head, palpi, and legs above brownish ochreous; spines on fore tibia black.

Expanse  $1\frac{2}{10}$  inch.

*Hab.* Bombay (*Dr. Leith*). In coll. F. Moore.

—*CURUBASA MARGINATA*, n. sp.

*Male.* Somewhat paler than *C. calamaria*. Fore wing with an ochreous-grey band along posterior margin: hind wing with the basal area slightly greyish brown. Underside of fore wing with the basal and discal areas greyish brown, costal border pale yellow. Front of head, palpi, and legs above purplish grey; fore tibial claws black.

Expanse 1 inch.

*Hab.* N.W. Himalaya. In coll. F. Moore.

— *ADISURA*, n. g.

Fore wing comparatively short and broad, triangular, costa nearly straight, apex very acute, exterior margin oblique and even, posterior margin short; first subcostal branch emitted from half length of the cell, second near the end, trifurcate, the third and fourth at equal distances from base of second, fifth curved upward from end of the cell and touching the third close to its base; discocellular concave, slightly bent near its lower end; upper radial from end of the cell, lower from angle of discocellular; upper median branch from angle above end of the cell, middle branch from the end, lower at some distance before its end. Hind wing triangular, rather broad and short; costa nearly straight, exterior margin convex and much waved, abdominal margin short; two subcostal branches emitted from end of the cell; discocellular very slender, slightly concave; radial extremely slender, emitted from middle of discocellular; two upper median branches from slightly beyond end of the cell, lower from one third before its end. Body short, stout; palpi stout, laxly squamose, apical joint thick, short; legs laxly pilose; antennæ minutely pectinated in male.

Type *A. atkinsoni*.

—*ADISURA ATKINSONI*, n. sp. (Plate XXXVII. fig. 6.)

*Male and Female.* Fore wing pale purplish brownish-ochreous, with a suffused paler fascia from base through the cell to the apex; indistinctly speckled with minute black scales, which are most apparent on the costal border; a curved discal transverse recurved series of minute black points, which are less distinct in the male: hind wing pale ochreous-yellow, with a slight purplish-brown sub-marginal fascia; median and submedian veins lined with darker brown scales. Underside of both wings uniformly pale ochreous, with a few brown speckles along the costal border. Thorax brownish ochreous; pectus, palpi at the side, and legs brighter ochreous, fore and middle femora with a brown streak; abdomen above brown-speckled.

Expanse, ♂  $1\frac{1}{2}$ , ♀  $1\frac{5}{12}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

—*ADISURA LEUCANIODES*, n. sp.

*Male and Female.* Fore wing pale brownish ochreous, greyish along the costal border; minutely brown-speckled, which gives it the appearance of a fascia along the costa and from below the apex to posterior margin; some indistinct brown spots within the cell, and a transverse recurved row of minute indistinct black points; cilia brownish, edged with white: hind wing whitish ochreous at base, ochreous externally, and with a distinct continuous marginal suffused brown band; cilia ochreous-white. Body, palpi, and legs ochreous; thorax greyish. Underside pale ochreous: fore wing with a discal dusky band and discocellular spot.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Kutch (Western India). In coll. F. Moore.

—*ADISURA MARGINALIS*.

*Anthophila marginalis*, Walker, Catal. Lep. Het. B. M. xii. p. 830 (1857).

*Male and Female.* Pale gamboge-yellow: fore wing with a pale pink band along the costa and a similar band above the posterior margin; extreme edge of the costa yellow; cilia pale pink, edged with white: hind wing paler yellow at the base, with a slight ochreous outer border; cilia edged with white.

Expanse, ♂  $1\frac{1}{2}$ , ♀ 1 inch.

*Hab.* Calcutta. In coll. F. Moore and Dr. Staudinger.

*ADISURA DELICIA*.

*Heliothis delicia*, Felder and Rogenh. Nov. Voy. iv. pl. 108. f. 40 (1872).

*Hab.* Bangkok; Amboina (*Felder*).

—*ADISURA DULCIS*, n. sp. (Plate XXXVII. fig. 20.)

*Male and Female.* Fore wing golden yellow, with a prominent purplish-pink band along the costal, exterior, and posterior margins;



cilia entirely pink : hind wing pale yellow, with a distinct dusky-brown marginal band ; cilia yellowish white. Underside pale yellow ; fore wing with the veins broadly suffused with dusky black, and a blackish discal fascia. Body pale brownish ochreous ; thorax, palpi, and legs above ochreous-brown.

Expanse 1 inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

*ADISURA PALLIDA*, n. sp.

*Male.* Fore wing pale purplish ochreous-grey, with the costal edge and longitudinal streaks extending to outer margin very pale ochreous-brown ; a few minute black speckles on costal and posterior borders ; a curved discal transverse row of minute black points ; cilia edged with white : hind wing ochreous-white, with an indistinct pale-brown median submarginal fascia. Underside ochreous-white. Thorax and head ochreous-grey ; palpi at the side, and legs above, ochreous-brown.

Expanse  $1\frac{1}{10}$  inch.

*Hab.* Ceylon. In coll. F. M. Mackwood.

Nearest allied to *A. leucanioides*.

*ADISURA SIMILIS*, n. sp.

Allied to *A. marginalis*. Differs from it in being of a pale ochreous yellow ; the fore wing with similar marginal bands and cilia, but with the disk crossed by an indistinct recurved row of brown speckles, some speckles also being present towards the base of hind margin : hind wing whitish at the base.

Expanse, ♂ ♀  $1\frac{1}{2}$  inch.

*Hab.* Calcutta. In coll. F. Moore and Dr. Staudinger.

Fam. ANTHOPHILIDÆ.

Genus HYDRELIA, Guén.

—*HYDRELIA CONJUGATA*, n. sp.

*Male and Female.* Fore wing dark umber-brown ; costal border pale ochreous-brown, with darker streaks between the costal and subcostal veins ; a white-bordered, brown elongated outwardly-oblique orbicular mark, which is confluent hindward with a similar upright reniform mark, an oblique pale streak below the cell in a line with the orbicular mark ; these markings indistinct in the female : hind wing ochreous-brown ; thorax, palpi, and legs above brown-speckled.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

Genus THALPOCHARES, Lederer.

*Micra*<sup>1</sup>, Guénée, Ann. Soc. Ent. Fr. x. p. 224 (1841).

—*THALPOCHARES PARVULA*, n. sp.

Near to the European *T. parva*, but of smaller size. White :

<sup>1</sup> Previously used in Diptera.

fore wing with a straight transverse dark ochreous-brown median band, a recurved discal white line, the outer margin clouded with ochreous brown, a black dot before the apex: hind wing white. Body, palpi, and legs white; second joint of palpi with a pale ochreous band.

Expanse  $1\frac{6}{12}$  inch.

*Hab.* Bombay. In coll. F. Moore.

—*THALPOCHARES ALBIDA*, n. sp.

White: fore wing with a very pale slender ochreous-brown median transverse oblique band, and an interrupted submarginal similar band: hind wing white, with a very faint pale ochreous margin.

Expanse  $1\frac{5}{12}$  inch.

*Hab.* Bombay. In coll. F. Moore.

—*THALPOCHARES ROSEANA*, n. sp.

*Micra roseana*, V. M. d. R. MS.

*Male and Female.* Ochreous-white: fore wing with a very oblique median transverse greenish ochreous-brown band, and a broadly recurved transverse discal whitish line, the interspace being bright purple-red; outer margin greenish ochreous-brown, with a minute indistinct apical and posterior black dot: hind wing with greenish ochreous-brown outer margin. Body, palpi, and legs white; second joint of palpi and fore legs above ochreous.

Expanse, ♂  $1\frac{5}{12}$ , ♀  $1\frac{6}{12}$  inch.

*Hab.* Bombay (*Dr Leith*). In coll. F. Moore.

Slightly smaller in size than the allied *T. rivula*, the oblique transverse fascia and line being more oblique. It has also been taken at Dharmasala by Rev. J. H. Hocking.

—*THALPOCHARES TRIFASCIATA*, n. sp. (Plate XXXVIII. fig. 21.)

White: fore wing with two oblique transverse narrow basal bands, and a broad outer lilac-grey band, each thickly studded with ochreous-brown scales; a slight apical red patch bordered by a few black dots, which continue hindward indistinctly to the angle: hind wing thickly studded with ochreous-brown scales on posterior area. Body brown-scaled; fore tarsi with brown bands.

Expanse  $1\frac{8}{12}$  inch.

*Hab.* Calcutta. In coll. Dr. Staudinger.

—*THALPOCHARES QUADRILINEATA*, n. sp. (Plate XXXVIII. fig. 14.)

Fore wing pale ochreous, irrorated with minute brown scales, these scales darkest along inner border of four transverse equidistant pale lines, and also on the costa before the apex, the basal line very indistinct; a white streak from the apex followed by a recurved row of indistinct black speckles; outer border bright ochreous: hind wing ochreous-white, with ochreous marginal line. Body, palpi, and legs above ochreous.

Expanse  $1\frac{8}{12}$  inch.

*Hab.* Calcutta. In coll. Dr. Staudinger.

*THALPOCHARES DIVISA*, n. sp.

*Male and Female.* Yellow: fore wing with a broad outer dark ochreous band occupying half the wing, the inner border of the band formed by a delicate black line, broadly suffused outwardly across the disk with ochreous-red, the exterior margin of the wing also ochreous-red and traversed by a narrow white line, on which are a few minute black dots; two indistinct black dots also at end of the cell: hind wing with a slight ochreous outer margin.

Expanse  $\frac{5}{8}$  inch.

*Hab.* Allahabad (*Hellard*); Calcutta (*Grote*); Ceylon (*Mackwood*). In coll. F. Moore.

*THALPOCHARES BIFASCIATA*, n. sp.

White: fore wing with a broad transverse median band and the outer margin clear golden-yellow, the inner border of the latter deeply waved: hind wing and body white.

Expanse  $\frac{5}{12}$  inch.

*Hab.* Allahabad, Punjab, N.W. India (*Hellard*). In coll. F. Moore.

*THALPOCHARES FLAVIDA*, n. sp.

Fore wing pale ochreous-yellow, crossed by two median indistinct narrow red lines: hind wing pale ochreous-red; cilia ochreous-white. Body, palpi, and legs above pale ochreous.

Expanse  $\frac{7}{12}$  inch.

*Hab.* Allahabad, Punjab, N.W. India (*Hellard*). In coll. F. Moore.

Genus *LEPTOSIA*, Guén.*LEPTOSIA QUINARIA*, n. sp.

*Male and Female.* Brownish grey: fore wing with a basal and three equidistant median transverse waved pale-bordered brown bands, each broadest and darkest at the costal end; an outer transverse sinuous pale-bordered black line: hind wing cinereous along the costal border, brown-speckled on posterior half, with short transverse pale sinuous bands. Body, palpi, and legs brownish grey.

Expanse  $1\frac{0}{2}$  inch.

*Hab.* Allahabad, Manpuri, N.W. India. In coll. F. Moore.

Genus *ACANTHOLIPES*, Lederer.

*Acantholipes*, Lederer, Die Noct. Europa's, p. 198 (1857).

*Docela*, Walker, Catal. Lep. Het. B. M. xxxiv. p. 1258 (1865).

*Microphysa* (part), Boisduval.

*ACANTHOLIPES FLAVISIGNA*, n. sp.

*Female.* Ochreous-grey: fore wing with a transverse oblique median brown fascia which is narrow at the costal end, and has a deeply-waved outer border; a discal transverse, curved, oblique narrow ochreous line, with outer irregular zigzag brown border; a

discocellular lunule: hind wing with a transverse fascia, joined by a discal ochreous band, with outer brown band. Body, palpi, and legs above ochreous, brown.

ch.

ay (*Dr. Leith*). In coll. F. Moore.

*vetustalis* (*Docela vetustalis*), Walk. l. c. p. 1258.

*PES NIGRISIGNA*, n. sp.

y: fore wing with a dark-brown median oblique fascia, r of which is almost straight; the discal ochreous line with dark-brown outer irregular border; discocellular ind wing with median transverse brown fascia, ochreous brown outer border. Body, palpi, and legs above

ch.

ay (*Dr. Leith*). In coll. F. Moore.

*PES HYPENOÏDES*, n. sp.

*male*. Upperside—fore wing greyish ochreous-brown, vered with dark-brown speckles, with a transverse ackish-brown band, which is broadest in the female, ardly by a slender yellowish line indistinctly angled at and bent inward to the costa; a dark-brown waved e apex; the outer margin with a pale line below the e pale speckles at end of the costa: hind wing pale n. Underside pale ochreous-brown; both wings ed with darker brown along the costal border; hind istinct transverse brown-speckled line. Body, palpi, greyish brown.

to 1 inch.

ing. In coll. Dr. Staudinger.

#### Fam. ERASTRIIDÆ.

##### Genus ERASTRIA, Ochs.

*ALLIDISCA*, n. sp. (Plate XXXVII. fig. 14.)

*female*. Smaller than *E. albiorbis*: fore wing paler fern, the transverse markings smaller, with the median white and irregularly speckled hindward; the orbiform spots indistinct, smaller, and of the same colour ea.

ch.

ing. In coll. Dr. Staudinger.

*ARGINATA*, n. sp. (Plate XXXVII. fig. 21.)

ark greyish ferruginous-brown, with a broad pale fer- along the hind margin, and extending two thirds up gin, where it is slightly whitish and black-streaked; whitish discal transverse sinucus line; orbicular and

reniform spots indistinct: hind wing cinereous-brown. Thorax pale ferruginous; palpi and legs dark ferruginous-brown, with pale bands.

Expanse  $1\frac{2}{3}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

#### Genus PHOTHEDES, Lederer.

##### —PHOTHEDES BIPARS, n. sp. (Plate XXXVIII. fig. 7.)

Allied to the European *P. captiuncula*, Zeller. Fore wing with the basal half dark brown, enclosing a white-lined narrow reniform spot; outer half pale brown, the margin and cilia speckled with dark brown: hind wing and abdomen pale brown. Thorax and fore legs above dark brown; collar, front of head, and palpi greyish brown.

Expanse  $\frac{9}{10}$  inch.

*Hab.* Cherra Punji, Assam. In coll. Dr. Staudinger.

#### Genus BANKIA, Guén.

##### —BANKIA ANGULIFERA, n. sp.

Fore wing very pale dull purplish ochreous, with two median transverse inwardly oblique slender pale lines, the outer line bent inward near the upper end to costa; a very indistinct submarginal series of minute brown dots: hind wing very pale purplish cinereous. Body pale brownish ochreous; palpi and fore legs above ochreous-brown, with pale tarsal bands.

Expanse  $\frac{9}{10}$  inch.

*Hab.* N.W. Himalaya. In coll. F. Moore.

##### —BANKIA LATIVITTA, n. sp.

Fore wing pale ochreous-brown; basal third very obliquely white, the border defined by an irregular slender brown line; an oblique discal white band extending from posterior angle to the costa, and enclosing two black discocellular dots, the costal end projecting obliquely outward, and again indistinctly merging in the band on the disk; an oblique dark-brown speckled fascia from the apex; cilia blackish: hind wing cinereous-brown. Thorax white; abdomen cinereous, brown-speckled.

Expanse  $\frac{8}{10}$  inch.

*Hab.* Nilgiris, S. India. In coll. F. Moore.

##### —BANKIA ERECTA, n. sp.

Fore wing whitish, with an erect median transverse narrow ochreous or dark olive-brown band, with black inner border; a similar-coloured fascia from the apex, leaving a curved white space before the anterior end of the band, and a fascia along exterior margin; a black dot at base of the costa and two at end of the cell, the upper one being indistinct; some speckles at the exterior apex and the cilia blackish: hind wing pale cinereous. Body whitish.

Expanse  $\frac{8}{10}$  inch.

*Hab.* Nilgiris, S. India. In coll. F. Moore.

## Fam. ERIOPIDÆ.

## —METHORASA, n. g.

Allied to *Calloplistria*. Fore wing less acuminate, exterior margin less oblique and more even; first subcostal branch and the lower median comparatively nearer end of the cell. Hind wing more convex externally; cell broader; discocellular more erect. Thorax more compactly clothed; palpi smaller, second joint of uniform lateral width, third joint very short and thick; antennæ in male of normal form, and more minutely bipectinate; legs less pilose.

Type *M. latreillei*.

## —METHORASA LATREILLEI.

*Eriopus latreillei*, Duponchel, Lep. Suppl. iv. p. 327, pl. 123. f. 2; Guén. Noct. ii. p. 296.

*Calloplistria latreillei*, Walker, Catal. Lep. Het. B. M. xii. p. 862.

*Eriopus quieta*, Treit. Schmett. iii. p. 259, Suppl. p. 49.

*Hab.* C. and S. Europe, N.W. India (Solun, Dharmasala).

There appear to be two forms (which are perhaps seasonal) of this species in N.W. India. Some specimens of both sexes are comparatively smaller, distinctly paler above, and with all the markings, including the sagittate mark near the apex, white; the underside also is much paler in colour.

## —COTANDA, n. g.

Fore wing elongated, narrow; costa almost straight, apex acute, exterior margin angled in the middle, posterior margin recurved; costal vein extending two thirds the margin; first subcostal branch emitted at half length before end of the cell, second at one fourth, trifurcate, the third at one fourth from base of second, fourth at one third from base of third, fifth from end of the cell and touching the third near its base; discocellular bent near each end, slightly concave in the middle, the radials from the angles; upper median branch from oblique angle at end of the cell, middle branch from angle before the end, lower at one third before the end; submedian curved downward and extending near the posterior margin. Hind wing with the costal margin long, straight, apex convex, exterior margin waved, abdominal margin short; costal vein slightly recurved, extending to apex; two subcostal branches from end of the cell; discocellular slightly bent near lower end, radial from the angle; two upper median branches from end of the cell, lower at one third before its end; submedian and internal vein straight. Body moderately stout, abdomen extending beyond hind wing; palpi broad laterally, slightly ascending, second joint laxly squamose, extending two thirds its length beyond the head, third joint short; legs long, femur slightly pilose beneath, tibia laxly squamose; antennæ filiform.

## —COTANDA PLACODOIDES.

*Eriopus placodoides*, Guénee, Noct. ii. p. 296.

*Hab.* Java; S. and N. India.

✓*PHALGA*, n. g.

Fore wing—costa almost straight; apex pointed; exterior margin oblique and scalloped, angular in the middle; first subcostal branch emitted at one third before end of the cell, second at one sixth before its end, third at one eighth from below base of second, fourth at three fourths from third, fifth from end of the cell, bent obliquely upward and slightly touching third near its base; discocellular extremely slender, slightly bent at each end, convex in the middle, radials from upper and lower angles; upper median branch emitted from angle above end of the cell, middle branch from its end, lower at nearly one half before its end; submedian recurving from the base. Hind wing narrow; exterior margin convex, slightly scalloped; abdominal margin short; costal vein extending to apex, two subcostal branches emitted from end of the cell; discocellular extremely slender, radial from its lower end; cell very short; upper median branch from angle above end of the cell, middle branch from its end, lower at one third before the end; submedian and internal vein recurved. Body moderate, abdomen laterally tufted; palpi ascending, not extending above the head, second joint stout, third slender; fore tibia laxly tufted; antennæ filiform.

Allied to *Lineopalpa*, Guénée.

—*PHALGA SINUOSA*, n. sp. (Plate XXXVII. fig. 7.)

Fore wing pale dull brownish ochreous, with a very indistinct black-speckled-bordered, pale, zigzag subbasal transverse line, a more distinct black treble discal acute-angled zigzag line, a submarginal single line, and less distinct marginal lunular line; a pale yellowish reniform mark: hind wing ochreous-brown; cilia brownish ochreous; a slender black marginal lunular line and streaks above anal angle. Body brownish ochreous; thorax, palpi, and fore legs ochreous-brown.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

Fam. EURHIPIDÆ.

Genus *EUTELIA*, Hübner.

—*EUTELIA SICCIFOLIA*, n. sp.

Greenish ochreous, numerous covered with short indistinct dusky strigæ: fore wing crossed by five or six irregular waved indistinct blackish lines and an oblique subapical line, the costal border clouded with brown, the edge at the apex black-speckled: hind wing suffused with purplish brown on exterior border, with irregular transverse indistinct blackish lines; a slender semidiaphanous-white discocellular streak. Front of thorax, head, palpi at the side and in front, black; legs above black.

Expanse  $1\frac{1}{10}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

Allied to *E. viridatrix*.

## Genus VARNIA, Walker.

## —VARNIA FENESTRATA, n. sp.

Deep dull chocolate-red, washed with chalybeate-grey, marked with very indistinct blackish confluent strigæ; fore wing with transverse very indistinct black lines, those on the basal half waved, the discal and subapical line being oblique, straight, and joined together on the costa, the interdiscal space bordering these two lines brighter red; some pale yellow spots on the costal edge: hind wing with a large, irregular, quadrate semidiaphanous white discocellular spot, and some contiguous pale yellow streaks. Body with red dorsal streaks; palpi black laterally.

Expanse  $1\frac{3}{10}$  inch.

*Hab.* Darjiling. In coll. Dr. Staudinger.

## Fam. PLUSIIDÆ.

## Genus EUCHALCIA, Hübner.

## —EUCHALCIA CASHMIRENSIS, n. sp.

Fore wing brownish olive-green, with a transverse olive-white basal line, an antemedian line curving below the cell, an undulated postmedian line, and two submarginal lines; orbicular and reniform marks formed by a similar olive-white line; the outer border of the pale lines tinged with cupreous-brown: hind wing pale purplish brown; cilia ochreous. Thorax brownish olive; abdomen ochreous, dorsal tufts bright ochreous; palpi and legs pale ochreous; tarsi and antennæ brighter ochreous.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Sind valley, Cashmir. In coll. Dr. Staudinger.

Allied to *E. uralensis* and *E. modesta*.

## Fam. CALPIDÆ.

## CULASTA, n. g.

Fore wing elongate; costa nearly straight; apex acute; exterior margin convex towards the posterior angle, posterior margin very convex near the base; first subcostal branch emitted at nearly one half before end of the cell, second at one fifth, third from near base of second, and fourth from near the apex; fifth from end of the cell, ascending to, but not touching, the third near its base; discocellular bent near each end, concave and very slender in the middle, radials from the angles; cell long, extending more than half length of the wing; upper median branch from angle above end of the cell, middle branch from its end, lower at one third before the end; submedian recurved. Hind wing somewhat short and broad, exterior margin waved, convex; costal vein nearly straight; two subcostal branches from end of the cell; discocellular bent inward in the middle, radial from its lower end; cell broad, short; two upper median branches emitted from angle at end of the cell, lower at one fourth before its end; submedian and internal vein slightly curved. Body stout,



head flat above; palpi large, thick, pointed at the tip, ascending to the vertex and then projecting out in front; legs moderately long, laxly squamose; antennæ filiform.

—*CULASTA INDECISA*, n. sp.

Fore wing pale greyish ochreous, greyest externally, with an indistinct oblique grey streak ascending from middle of posterior margin to below the apex, the streak bordered on the inner side by a contiguous brown line, which is broken and diffused at the apex, and on the outer side by broader suffused brown lines; a minute brown dot at lower end of the cell, and a row of dots on outer margin: hind wing whitish ochreous; cilia white. Body, palpi, and legs pale ochreous.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Madras; Bombay (*Dr. Leith*); Benares (*Atkinson*). In coll. F. Moore and Dr. Staudinger.

Fam. HYBLÆIDÆ.

—Genus PHYCODES.

*Phycodes*, Guénée, Noct. xi. p. 389 (1852).

*Tegna*, Walker, Cat. Lep. Het. B. M. xxxv. p. 1810 (1866).

Wings elongated: fore wing narrow, rectangular; exterior margin almost erect; costal vein extending two thirds the margin; first subcostal branch emitted at half length of the cell, second at one fifth, third, fourth, and fifth from end of the cell; discocellular very slender, slightly bent at each end, radials from the angles; cell very long and narrow, extending two thirds the wing; upper and middle median branches from angles at end of the cell, lower from one fifth before the end; submedian much waved. Hind wing long, costal margin extending to length of fore wing, exterior margin very oblique, abdominal margin short; costal vein nearly straight, extending to apex; subcostal waved, first and second branches emitted from immediately before end of the cell; discocellular slightly oblique and convex, radial from slight angle near its middle; two upper median branches emitted at a short distance beyond end of the cell, lower at one third before its end; submedian straight, internal vein curved. Body short, stout, smooth, abdomen thick; front of thorax and head projecting much beyond base of costa; palpi short, not extending beyond the head, second joint very broad and flat, third joint minute, conical; legs smooth, short; middle and hind tibiæ short, thick, spined and with slight spiny tufts above; antennæ thickened near the base, tips slightly clavate in male.

—*PHYCODES HIRUNDINICORNIS*.

*Phycodes hirundinicornis*, Guénée, Noct. ii. p. 389 (1852).

*Tegna hyblæella*, Walker, Cat. Lep. Het. B. M. xxxv. p. 1810 (1866).

*Hab.* N. and S. India (Lucknow, Calcutta, Madras, Bombay).

## PHYCODES TORTRICINA, n. sp.

Fore wing dark cupreous-brown, with a blackish patch on posterior margin towards the base, an indistinct blackish patch on the discal area: hind wing darker, with less-defined yellow basal streak than in *P. hirundinicornis*. Underside more uniformly coloured, no yellowish streaks on the discal areas.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Canara, S. India (*Ward*). In coll. F. Moore.

## PHYCODES QUIRIS.

*Atychia quiris*, Felder and Rogenh. Novara Voy. iv. pl. 139. f. 36 (1875).

*Hab.* S. Africa (*Trimen*).

## PHYCODES MINOR, n. sp.

Fore wing cupreous-grey, with a slender cupreous-brown median transverse band: hind wing greyish cupreous; cilia white. Underside uniformly brown. Body cupreous-grey; second joint of palpi white, third joint black; legs cupreous-brown above, femora beneath and bands above white.

Expanse  $\frac{8}{10}$  inch.

*Hab.* N.W. India; Caragola, Bengal (*Atkinson*). In coll. F. Moore and Dr. Staudinger.

## PHYCODES MACULATA, n. sp.

Fore wing cupreous-black, very indistinctly speckled with minute grey scales, with several golden-yellow spots on the basal and median areas, and longitudinal streaks on the exterior border: hind wing with a pale yellow linear streak from the base, a slender streak above the anal angle, and three spots on the upper part of the disk; cilia pale cinereous-yellow. Body cupreous-black, abdomen with slight yellow segmental bands; palpi black above, pure white at the side; legs black, femora golden yellow beneath, tarsi with yellow bands; antennæ black.

Expanse  $1\frac{1}{2}$  inch.

*Hab.* Darjiling. In coll. F. Moore and Dr. Staudinger.

## Tribe PYRALES.

## --AGASTYA, n. g.

Fore wing very short, broad; costal margin very convex at the base in male, slightly arched in female; apex acute; exterior margin slightly oblique; first subcostal branch emitted at one half before end of the cell, second very close to the end, third from the end, bifid, the fourth thrown off near the apex, fifth from angle below end of the cell; discocellular outwardly oblique, bent near the upper and lower end, concave in the middle, radials from the angles; upper median branch from end of the cell, middle branch from near its end, lower at one third before the end; cell broad, longest at its lower end; submedian straight. Hind wing very broad, short, apex

hardly convex, exterior margin convex towards anal angle; costal vein thick at the base, concave in the middle, subcostal anastomosed to costal from its base to near end of the cell, and the first branch again anastomosed to it immediately beyond the cell to half its length, second branch emitted from end of the cell; discocellular extremely slender, very obliquely concave; cell short anteriorly, lengthened into an acute angle posteriorly, the radial and upper median branch being emitted together from its extreme angle; middle median branch from immediately before the angle, lower at one fourth before the end; submedian and internal veins straight. Body extending slightly beyond hind wing; thorax stout; palpi porrect, convergent at the tip, laterally broad, with a slight tuft projected upward from base of second joint, third joint minute, conical; legs long, smooth, fore tibia slightly tufted beneath; antennæ minutely serrated in male.

— *AGASTIA HYBLÆOIDES*, n. sp.

*Male and Female.* Fore wing cupreous-brown, with a purplish gloss; a very indistinct darker discocellular patch and submarginal transverse fascia; a prominent pale yellow triangularly lobate spot on middle of posterior margin: hind wing blackish cupreous-brown, with an ochreous-yellow round discal spot and slight contiguous inner streak; cilia ochreous-yellow, alternated with black at the apex, middle, and anal angle. Body and palpi olivaceous-brown; legs pale yellow; fore tibia with a slight brown terminal band.

Expanse  $1\frac{1}{4}$  inch.

*Hab.* Darjiling, June (*Atkinson*). In coll. Dr. Staudinger and F. Moore.

— *AGASTYA FLAVOMACULATA*, n. sp.

Similar to *A. hyblæoides*. Smaller in size: fore wing differs in having a small oval yellow spot situated between the median and submedian veins: hind wing paler at the base; marked the same.

Expanse 1 inch.

*Hab.* Darjiling (*Atkinson*). In coll. Dr. Staudinger.

EXPLANATION OF THE PLATES.

PLATE XXXVII.

- Fig. 1. *Thyatira decorata*, n. sp., p. 328.
2. *Palimpsestis alternata*, n. sp., p. 331.
3. — *cuprina*, n. sp., p. 331.
4. *Aletia distincta*, n. sp. p. 333.
5. *Hydræcia khasiana*, n. sp., p. 342.
6. *Adisura atkinsoni* ♀, n. sp., p. 363.
7. *Phalga sinuosu*, n. sp., p. 375.
8. *Leucania compta*, n. sp., p. 336.
9. — *albistigma*, n. sp., p. 337.
10. — *albicosta*, n. sp., p. 338.
11. — *modesta*, n. sp., p. 335.
12. *Borolia fasciata*, n. sp., p. 334.
13. *Churia nigrisigna*, n. sp., p. 360.

- Fig. 14. *Erastria pallidisca*, n. sp., p. 372.  
 15. *Leucania nainica*, n. sp., p. 337.  
 16. — *houra*, n. sp., p. 337.  
 17. — *dharma*, n. sp., p. 338.  
 18. — *bistrigata*, n. sp., p. 334.  
 19. — *consimilis*, n. sp., p. 336.  
 20. *Adisura dulcis*, n. sp., p. 368.  
 21. *Erastria marginata*, n. sp., p. 372.

## PLATE XXXVIII.

- Fig. 1. *Neuria simulata*, n. sp., p. 343.  
 2. *Apamea cuprina*, n. sp., p. 345.  
 3. *Graphiphora flavirena*, n. sp., p. 352.  
 4. — *nigrosigna*, n. sp., p. 352.  
 5. *Hermonassa sinuata*, n. sp., p. 353.  
 6. *Megasema cinnamomea*, n. sp., p. 352.  
 7. *Photkedes bipars*, n. sp., p. 373.  
 8. *Apamea mucronata*, n. sp., p. 345.  
 9. — *strigidisca*, n. sp., p. 346.  
 10. — *nubila*, n. sp., p. 346.  
 11. *Nattia monilis*, n. sp., p. 348.  
 12. — *cervina*, n. sp., p. 348.  
 13. *Acosmetia nebulosa*, n. sp., p. 350.  
 14. *Thalpochares quadrilineata*, n. sp., p. 370.  
 15. *Caradrina delecta*, n. sp., p. 349.  
 16. *Celena sikkimensis*, n. sp., p. 348.  
 17. *Hermonassa chalybeata*, n. sp., p. 353.  
 18. *Euplexia distorta*, n. sp., p. 354.  
 19. *Cosmia hypenoides*, n. sp., p. 354.  
 20. *Dianthea confluenta*, n. sp., p. 354.  
 21. *Thalpochares trifasciata*, n. sp., p. 370.

## 2. On *Halichærus grypus* and its Breeding on the Fro Islands off Throndhjems-fjord in Norway. By ROBERT COLLETT, C.M.Z.S.

[Received January 28, 1881.]

In Norway the Grey Seal (*Halichærus grypus*) is found along the entire coast-line as far north as Tromsø. Although it is beyond comparison the most common species of Seal after *Phoca vitulina*, it can hardly be called numerous; but here and there are special places of resort, where they collect together in the autumn for breeding-purposes. In the most northern parts of the country it is doubtless rare, although our knowledge of the Seals of those regions is very limited. It has, however, been observed at Tromsø (69° 30') by Professor Lilljeborg; but no reliable observations have been made as to its existence in Finmark proper.

One of the principal breeding-places of this Seal is the Fro Islands, outside the Throndhjems-fjord, a group of small low-lying islands, stretching about 50 or 60 kilometres from south to north, at a distance of about 30 or 40 kilometres from the mainland. Besides eight inhabited islands, the group contains an innumerable

number of islets, many of which are invisible at high tide and in calm weather; but during stormy weather, and when an onshore wind is blowing, the sea breaks on them with great fury, making this part of the sea one of the most perilous along the coast.

Mr. F. Borthen, the sole proprietor of these islands, has with great readiness on several occasions given me full particulars concerning the stay of the Seals at this group. I have already on one or two occasions made known the more important details of these notes (the last time in 1876<sup>1</sup>), without, however, having examined the specimens themselves, on which account I erroneously referred them to *Phoca barbata*, the name under which the specimens from this locality, all of them in their blackish (not grey) dress, have hitherto been exhibited in our Norwegian museums. In December last year, after having examined a specimen that Mr. Borthen had kindly presented to the University's Museum in Christiania, I discovered that the species from the Fro Islands is *Halichoerus grypus*, and not *Phoca barbata*, a mistake which I have the greatest reason to regret<sup>2</sup>. I have carefully gone through the particulars received from Mr. Borthen with that gentleman, both verbally and in writing; and as they are in every respect quite reliable, and on certain points more complete than any we have hitherto been acquainted with regarding any other kind of northern Seal, I give them here, together with observations made in subsequent years.

#### A. *Breeding-habits.*

The breeding of *H. grypus* takes place on the Fro Islands in the autumn. In the middle of September they begin to assemble rapidly from the south on the most northern of the Fro Islands in order to breed, especially about two miles south of the fishing-station Halton, the most northern point of the group. None appear to come from the north; the coast in this direction being less provided with such sunken rocks and islets as these Seals are in the habit of resorting to. The next breeding-place to the north of the Fro Islands is probably on the outer side of the Vigten Islands, a long and projecting group of islands on the border of Helgeland, about one degree further north.

The number of Seals belonging to the Fro-Islands breeding-district

<sup>1</sup> Lilljeborg, 'Sveriges och Norges Ryggradsdjur.' I. Däggdjuren, p. 701 (Upsala, 1874); Fogh, Lütken, Warming, 'Tidsskrift for populære Fremstillinger af Naturvidenskaben,' 5 R. 3 B. p. 14 (Kjöbenhavn, 1876); Collett, 'Bemærkninger til Norges Pattedyrfauna (Nyt Magazin för Naturvidenskaberne,' 22 B. 1 & 2 H. p. 210, Christiania, 1876).

<sup>2</sup> In a most exhaustive and excellent work, 'History of North-American Pinnipeds' (Washington, 1880), Dr. Allen has given a monograph of those species of the families Rosmaridæ, Otariidæ, and Phocidæ which belong to the North-American fauna. In this work, in which Dr. Allen with great critical discernment has reviewed what was previously known through the observations of different naturalists, he has with good reason expressed some doubts whether I may not have confused the two above-mentioned species in the remarks which I have made in my papers on the subject.

(in which category must be reckoned all those existing from the Thronhjems-fjord to Christiansund, lat.  $64^{\circ}$ – $63^{\circ}$  N.) scarcely exceeds five or six hundred; and of this number it is probably only the full-grown ones that frequent the islands in the breeding-season. The number of Seals was at one time much greater; but the persecutions they are subject to during the summer in the outlying districts, and especially on the islands along the Romsdal coast, has caused an apparent diminution in the number of the breeders.

The greater part give birth to their young in the last week of September, most usually on the 29th or 30th, or the 1st of October—some a few days earlier and some later, but never after the middle of October.

The Seals probably begin to breed at the age of four years, or at the earliest three years, and give birth to only one young one annually. The young Seal at its birth is covered with a wool-like covering, which falls off after the lapse of a fortnight.

The outermost islets and rocks are chosen for breeding-places, which are mostly rather small, though as a rule large enough not to be washed over by the waves. If the weather be stormy immediately preceding the time of giving birth, the female always chooses one of the larger rocks, and generally places her young one above the highest water-mark, and then takes up her position on the highest part of the rock. If, on the other hand, the weather be unusually fine, she is often tempted to place her young one on such a low-lying rock that, if the weather be stormy whilst it is still in a weak condition, it is often washed away and perishes.

### *B. The First Stage of the Young.*

Whilst the navel-string yet remains the pup wears a yellowish-white coat, which, however, loses its colour in the course of the following days, and assumes about the same hue as the skin of the Polar Bear. After the lapse of from seven to ten days dark hairs begin to appear on the tips of the snout and feet; they are first apparent on the great toes of the fore feet. The colour afterwards increases in intensity; and after the lapse of three weeks the young one has entirely lost its woolly hair. The colour of the new dress differs from that of the old Seals; but there is a great variety in its colour among different individuals. Some are light with large dark patches, others are almost wholly dark green, whilst others again are almost black, though the belly is almost always lighter in colour than the back. This variation of colour remains during a great part of the growth; and it is only when they are fully grown that they become more uniform in this respect.

The pups pass the first three weeks of their life on land, until they have shed their woolly coat, often on exactly the same spot where they have been born, and pass their time exclusively in receiving nourishment from the mother and in sleeping. During this period of their lives they are by no means so strictly confined to the dry place of rest as is the case with the Harp Seal, which, so far

as we know, never enters the water voluntarily in its woolly coating; for, besides always finding a pleasure in wallowing in the small freshwater puddles on the rocks, they are often compelled, "*volentes volentes*," to take to the water at this early stage of their existence. For instance, if a female be often disturbed by man during the days of breeding, the entire family keeps close to the water's edge, and the young ones in the yellowish skins, as well as the old ones, are often to be seen swimming about among the islets; and if the former have once become accustomed to enter the water at an early age, they do so voluntarily, and are often splashing about in the neighbourhood of their native rocks, especially at high tide, whereas they follow the example of the old ones in remaining on the rocks at low water.

Heavy hailstorms also drive the pups very early to sea; and they do not like the thin sheets of ice which cover the small water-pools after a frosty night.

The females suckle their pups on land, but do not remain with them long at a time. The suckling probably takes place during the night, as they are often heard to utter cries at that time, which they never do in the water. They are also seen regularly suckling their pups early in the morning. The milk is extremely rich and thick, and is quite white.

As long as the young one retains its woolly coat and is allowed to remain undisturbed on its native island, it receives no other nourishment than the maternal milk. If it happen that bad weather or a heavy sea washes the new-born young one into the water, or if it be separated from the mother by other means, it nearly always dies, as it is unable to procure for itself the means of sustenance at that early period of life; but when they have attained the age of eight days they are able to stand the change of diet, even though they become extremely thin for a time. As a rule the young one can hardly support itself before the age of three weeks, although it can exist a long time without food, and it rarely dies before all the blubber with which it is coated has disappeared. In this manner young ones have been discovered in deep crevices, from which neither by their own exertions nor with the mother's assistance have they been able to free themselves; and, to judge from various circumstances, these young ones must have passed about a week and a half without food, although in order to maintain this fast they must have been in good condition beforehand.

When the young ones first come into the world they have very little flesh and hardly any blubber; but they increase very rapidly (nearly two or three kilogrammes daily), although they receive no other nourishment than the maternal milk. When a young one attains the age of three weeks, or the size at which it becomes the object of chase, it may contain from 20 to 30 kilogrammes of blubber, besides 12 to 18 kilogrammes of meat. Extremely fat specimens have been known to weigh 60 kilogrammes. But this rapid growth ceases as soon as the moulting process is completed, whereupon the parents leave it to support itself.

At this point the young ones begin, as it were, a new stage of their existence. Before the moulting takes place they are very stupid and wanting in shyness, and seldom attempt to escape at the sight of human beings; but when they have been left to themselves, and have once taken to the water, they become quite as cautious as the old ones. It is the same with those young ones which, as before mentioned, take to the water for different reasons; their presence of mind becomes more rapidly developed than in those which remain quietly on the rocks: although these can sometimes be approached very closely by boats, and even killed by the blow of an oar, they are, as a rule, extremely shy.

As soon as the young one has been left to its own resources, and to look for its own subsistence, it decreases rapidly in weight, and during the course of the winter often loses all the blubber it has acquired during the first period of its existence. At the same time the rapid growth ceases; so that in the spring it has only increased a trifle in length, and has hardly acquired any additional weight since the autumn.

### C. Copulation.

Immediately after the birth of the young one, copulation of the sexes takes place. If the female does not come down into the water of her own accord, the male goes up on the rock and drives her down, as the copulation only takes place in the water, during which they take up the same position as dogs and other four-footed animals. The female, however, is never entirely submerged, the snout being constantly kept above water, as is also the case with the male's head. Copulation apparently takes place several times.

The Grey Seal lives in a regular state of polygamy, as the strongest male drives all the younger males away, and lives with several females. At the same time the number of females one of the stronger sex can gather together is seldom very considerable, sometimes only two, and very rarely above four or five. This, however, is very difficult to arrive at with any degree of certainty, as the animals are in a constant state of activity during the breeding-time, and both sexes swim about together without passing much time on the land, as is the case with many other Seals. If a breeding-rock be so small that there is only room for two or three females, there is never more than one male to be found; but on larger rocks, where females and young lie beside one another, there are always several males to be seen, although never in such great numbers as the females. In the autumn of 1874 one of Mr. Borthen's seal-hunters found six young Seals with their respective mothers on a rock with only one male; this, however, was an unusually large number.

No mutual fidelity exists between the sexes; copulation seems to take place indiscriminately, whenever an opportunity presents itself for the male. If a single couple have settled down on a rock they may possibly be faithful to one another for a time, but only until a more powerful male presents himself and drives the other male away. Under such circumstances desperate fights ensue, of which



the lacerated skins of the animals give ample evidence. Sometimes great pieces of skin are torn off, especially on the neck and throat. These conflicts are so frequent that nearly all the older males bear scars from them, and it becomes difficult, when a specimen is required for museums &c., to find one perfectly uninjured.

The female on her part appears to be just as eager to accomplish copulation as the male; and it has often been observed that a male is sometimes so hard pressed by several females desirous of copulation, that he is compelled to seek refuge on the rocks and take to the water on the other side in order to get away; this has been certified by many eye-witnesses. However, there is seldom any want of males, although it is nearly without exception from among these that the few full-grown Seals (killed together with the young ones) are shot. If a family in this manner happens to lose its chief, a new one soon makes its appearance.

#### D. *Mode of Capture.*

From the earliest times the pursuit of the young Seals on the Fro Islands has commenced on a certain day, namely the 17th or 18th of October. The young, which are at this date three weeks old and about to leave the islands, are then in their best condition. If stormy weather or other reasons shall have delayed the pursuit until over this period, many young ones are found to have already taken to the sea, and are then difficult to catch, as they have become quite as shy and wary as the old ones. Such young ones as are found to be too small at the catching-time, and are consequently of less value, are left undisturbed; and they are often to be found at a later period on the same spot.

The young ones are killed by a blow on the snout with a wooden club about two feet in length; the full-grown ones are shot: but these, as a rule, are spared; and such is always the case with the females; the young ones which are estimated to have less than 12 kilogrammes of blubber on them also escape. The flesh and blubber of the young ones is eaten salted by the fishermen, and is said to taste tolerably well, as the young ones only subsist on the milk of the mother.

Although the capture is dependent on the state of the weather, the annual take always amounts to between 50 and 70 young ones. Some years (*e.g.* 1880) only half the usual produce is realized, stormy weather preventing approach to the most frequented places of resort. At the utmost there are not born more than 100 Seals annually at the breeding-places on the Fro Islands. It is useless to shoot the larger Seals in the water, as they generally sink instantaneously; they must either be shot on the rocks, or, as is generally the case, in shallow water, whence they can afterwards be taken up. The young ones always float when killed, except when they are very lean<sup>1</sup>.

<sup>1</sup> At Melø and Trøenen, in Nordland, where the capture of Seals is also carried on during the breeding-time in the autumn, the sealers are accustomed to steal on the animals whilst asleep and deal them a stunning blow with a

*E. General Remarks.*

A full-grown male Grey Seal weighs from 250 to 290 kilogrammes, and contains blubber of the weight of 70 or 80 kilogrammes, a few extremely large ones perhaps reaching 100 kilogrammes. The females weigh from 180 to 250 kilogrammes; as a rule about 220. During the pairing-time the males lose from 50 to 70 kilogrammes. The female, the blubber of which, so to speak, is transferred through the milk to the pups, loses somewhat less, or from 30 to 50 kilogrammes. They do not regain their good condition before the summer, when they rapidly begin to fatten, and in the beginning of August acquire their greatest fatness, at which time they are also most shy.

As soon as the pairing-time is over, and the young ones have taken to the sea, they assemble in small herds and leave the breeding-places, and gather about the outermost rocks to pass the winter; they never show themselves between the inmost islands. During the spring and early summer they lie together on certain rocks in such great numbers that the rocks are quite covered, and sometimes one sees the same rock covered for several days running. During the summer they principally take to the rocks at sunset, when the tide is falling, and remain there all night growling and crying, their numbers always increasing. At high tide the sea again washes them; but a few climb so high up that the sea cannot reach them, and these may often be observed lying over until the next high tide, perhaps longer.

During the winter they are more seldom to be seen on shore than at other seasons, as the sea continuously breaks over the rocks where they repose.

Smell is the most developed of their senses; and it is of little use to endeavour to approach a Seal in the same direction as the wind blows. On the other hand, it has less reliance on its powers of sight whilst above the water, as its powers of vision are principally adapted for use under water. Seals are, on the whole, very shy and careful, especially when they notice that they are being followed. They very often, however, come close up to a boat and swim about, regarding every thing with great curiosity. During the pairing-time, and also at other periods, the males may be drawn near by mimicking their cry.

They sleep both on the land and in the sea, in the latter only when there is a feeling of insecurity. During sleep the Seal holds the upper part of its head above the surface of the water. It never makes any show of resistance when it can escape, and never defends its young. With its long extremities it can move itself very rapidly, in spite of its clumsy build, and better than the other northern Seals. In case of danger, when the locality does not present too many obstacles, it can get away so rapidly that considerable

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club-like stick on the naked row of teeth (the upper lip being generally drawn up whilst asleep), and then to stick them with a knife. Guns are only used in case of need, so as not to disturb the others.

exertions are necessary to catch it, although its movements are in themselves extremely clumsy.

#### F. Food.

The food of the Seals on the Fro Islands seems to be principally fish; Halibut (*Hippoglossus vulgaris*) appears to be a delicacy to them. As a proof that they fetch their food from a considerable depth, it is related that a few years ago a young one was found caught by one of the hooks of a fishing-line that was placed at a depth of between 70 and 80 fathoms on the outer side of one of the islands. Grey Seals have several times been seen to come up to the surface with Lings (*Molva vulgaris*), and other deep-water fishes in their mouths, such fishes being seldom or never found at a less depth than between 60 and 70 fathoms.

There has never been any success with attempts made to rear young Grey Seals in confinement, although it has been tried several times on the Fro Islands.

3. A Note on *Rhipidura preissi*, Cab. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Senior Assistant, Department of Zoology, British Museum.

[Received February 23, 1881.]

When I wrote the fourth volume of the 'Catalogue of Birds' I was unable to say any thing about the Fantail Flycatcher of Western Australia (*Rhipidura preissi*), as no specimen existed at that time in any English collection, nor had it been figured by Gould in his Supplement to the 'Birds of Australia.' In fact, since it was described in 1850 by Dr. Cabanis, I believe that nothing whatever has been written concerning the species. I was pleased, therefore, on visiting Birmingham last November, to find an interesting collection of birds in that town in the possession of Mr. Walter Chamberlain, who obtained all his specimens himself during his travels in the Australian and Indian regions. Amongst other rarities, he had an example of *Rhipidura preissi*, shot in King George's Sound in Western Australia; and he very kindly responded to my request to lend me the specimen.

I find that, as stated by Dr. Cabanis, the species is very closely allied to *R. albiscapa*, but is more slaty brown, and differs in the grey spot on the throat, which is much lighter than in *R. pelzelni*, with which species I at one time supposed it might be identical. It seems to me to be a good species, if indeed any of these white-shafted Fantails are really worthy of specific rank; I think that they are rather races of one species, varying with locality.

The following is a description of Mr. Chamberlain's specimen:—

## RHIPIDURA PREISSI.

*Rhipidura preissi*, Cab. Mus. Hein. Th. i. p. 57 (1850); Gould, Handb. B. Austr. i. p. 240 (1865); Gray, Hand-l. B. i. p. 331, no. 4972 (1869); Ramsay, Pr. Linn. Soc. N.S.W. ii. p. 182 (1878); Sharpe, Cat. B. Brit. Mus. iv. p. 310, note (1879).

*Adult*. General colour above slaty brown, the head scarcely darker than the back; wing-coverts like the back, the greater series rather browner, and tipped with white like the median series, so as to form a double wing-bar; primary-coverts and quills brown, the inner secondaries externally bordered with white; tail-feathers brown, the two centre ones black-shafted, the others with white shafts and tipped with white, which extends down the inner web from the tip, increasing in extent towards the outermost, which has the outer web entirely white; lores, sides of face, and ear-coverts blackish, with a faint indication of a whitish streak over the fore part of the eye; throat whitish; remainder of under surface light ochraceous buff, becoming dull white on the under tail-coverts; the sides of the breast and the lower throat and fore neck ashy grey, the latter streaked with the same colour as the breast; under wing-coverts white, dusky internally; quills dusky brown below, lighter along the edge of the inner web. Total length 5·4 inches, culmen 0·3, wing 2·7, tail 3·25, tarsus 0·65.

On looking over my "Key to the Species" of these white-shafted Fantails, I am not quite satisfied with their arrangement, and would modify the characters given on pp. 303 and 304 of the Catalogue, as follows:—

- a. Three or more outer tail-feathers with entirely white or creamy-white shafts.
- a'. Centre tail-feathers with white shafts like the others ..... { *flabellifera*.
- b'. Two centre tail-feathers with brown shafts, the rest with white ones. { *bulgeri*.
- a". Breast not scaly, *i. e.* not mottled with dark centres to the feathers, but uniform ochraceous buff; throat white, with a patch of black or dull grey on the lower portion.
- a' . Outer web of external tail-feathers pure white for its whole extent.
- a<sup>4</sup>. Throat-patch black ..... { *albiscapa*.
- b<sup>4</sup>. Throat-patch grey, the fore neck also grey, streaked with ochraceous buff like the rest of the under surface ..... { *saturata*.
- b<sup>'''</sup>. Outer web of external tail-feathers dull white, brownish towards the tip ..... *preissi*.
- c<sup>'''</sup>. Outer web of external tail-feathers smoky brown, as also the tips to all the tail-feathers ..... *pelzelni*.
- ..... *brechleyi*.

4. Notes on the Anatomy of the *Erinaceidæ*.

By G. E. DOBSON, M.A., M.B., &amp;c.

[Received February 21, 1881.]

On entering upon the study of the Insectivora<sup>1</sup>, the species of the family Erinaceidæ recommend themselves as the primary objects for examination, not only on account of their comparatively large size, but also by their remarkably central position with respect to the other species of the Order.

Experience in dealing with the natural history of another mammalian order, the Chiroptera, has specially impressed upon the writer the great importance of investigating, as far as possible, the internal structure of the leading forms before attempting to classify the species according to their natural affinities. He therefore proposes, in treating of the natural history of each family of Insectivora, to preface the systematic part of the work with an account of the anatomy of the principal species<sup>2</sup>.

The family Erinaceidæ comprises two genera only, *Gymnura* and *Erinaceus*: the latter is represented by several species, inhabiting chiefly the temperate and subtropical parts of the Palæarctic, Ethiopian, and Oriental regions; the former by a single species, which is apparently limited to the Indo-Malayan subregion.

In the exception of a few scattered notices, all imperfect and species-act, and referring only to the common European Hedge-

The genus has hitherto been published of the anatomy of the inhabiting species.

*afflesii*, known only from a single species, *C.*, hitherto dried skins. Laterma, Sumatra, Java, and Borneo and some added to the collection or less imperfect skeleton has been Blanford, F.R.S., has placed a very perfect specimen; and Mr. W. T. a specimen of an adult for British hands for examination was obtained by Mr. Davis, preserved in alcohol, which Bankasún, in Southern Tenasserim.

<sup>1</sup> The following notes anatomy of the species of the family Erinaceidæ are extracted from the first part of a Systematic and Anatomical Treatise on the Insectivora, which the writer is about to publish as a separate work.

<sup>2</sup> For material which has formed the basis of this paper the especial thanks of the writer are due to Mr. W. T. Blanford, F.R.S., who placed his collection of the species of Asiatic Erinaceidæ at his disposal; to Mr. H. Flower, F.R.S., Conservator of the Hunterian Museum; to Dr. Blanford, F.R.S., Keeper of the Zoological Department of the British Museum; to Monsieur Fernand Lataste, President of the Zoological Society of France, who has forwarded for examination the valuable specimens of Insectivora collected in Algeria.

and in Mr. Blanford's paper "On some Mammals from Tenasserim," Nat. Soc. Bengal, xlvii. part ii. 1878, p. 150.

The following points in the osteology of this very remarkable form are especially worthy of notice<sup>1</sup> :—

The vertebral column is made up of 7 cervical, 15 dorsal, 6 lumbar, 7 sacro-coccygeal, and 23 caudal vertebræ. All the spinous processes, from the axis backwards to the last sacro-coccygeal vertebra, are well developed; that of the axis is enormous, flattened laterally, and antero-posteriorly expanded; the second dorsal is greatly elongated; the ten anterior dorsal spines are narrowed towards their extremities; the succeeding spines have their extremities progressively antero-posteriorly expanded and laterally flattened, merging into the shape of the lumbar spines, which are nearly as broad at their apices as at their bases. The four anterior cervical vertebræ develop spines (hypapophyses) from the centre of the ventral surface of the body of each, that of the axis being most prominent; the inferior lamellæ of the transverse processes of the sixth cervical vertebra are enormously expanded antero-posteriorly, like the spine of the axis; inferior lamellæ are also developed in the fifth, fourth, and third cervical vertebræ, but they are very much smaller. The first lumbar vertebra develops a small postero-externally directed transverse process; the remaining five vertebræ have long antero-externally directed falciform transverse processes many times larger and quite differently shaped; these are succeeded by seven sacro-coccygeal vertebræ, whereof the first two are articulated with the iliac bones. The first caudal vertebra is distinguished, not only by the absence of spinous and articular processes, but also by the want of the chevron bones, which are attached to the succeeding vertebræ except the terminal two or three. These are bifid, and consist of a pair of cylindrical bones attached by the middle, one on each side, to the lateral surface of the body of each vertebra at its posterior end, so that half of each projects horizontally back to the succeeding vertebra; the hypapophyses and transverse processes of most of the caudal vertebræ are well developed, but they diminish in length progressively backwards.

There are fifteen pairs of ribs, the thoracic cage is very capacious. Sternum narrow, not keeled, mesosternum consists of five segments; the xiphisternum is remarkably long and spatulate, terminating in an expanded cartilage, very like that in *Soricidæ*.

The pelvic opening is remarkably long and narrow, its width between the acetabula being but one ninth its diameter; the symphysis pubis extremely weak, the conjoined rathæ pubis and ischium forming an angular projection, which touches the corresponding projection of the opposite side.

Humerus well developed, with a supracondylar foramen large supratrochlear perforation. Carpus of seven bones, centrale; the scaphoid and lunar bones are evidently separate

<sup>1</sup> In Mr. Mivart's paper "On the Osteology of the Insectivora" (*J. Phys.* i. pp. 281-312), owing to want of material, the author has cursorily (with the exception of the skull) on the skeleton of this s

young, but in old animals united, the line of union, however, remaining distinct.

The greater and lesser trochanters of the femur are very large; and there is a strongly convex ridge immediately below the greater trochanter, representing a third trochanter.

In the teeth the form of the crowns of the first and second molars is especially noticeable: each has five conical cusps—one at each angle, the inner pair nearly as large as the outer, the fifth near the centre of the tooth, connected by an oblique ridge with the bases of the antero- and postero-internal cusps, and separated from both the external cusps (in the unworn tooth) by a deep groove<sup>1</sup> (fig. 1).

Fig. 1.



Crown of first upper molar (right side) of *Gymnura rafflesii*.

Several very interesting points are noticeable in the myology of this species. The *panniculus carnosus* is thin, and consists chiefly of two pairs of extensive muscles, lining the skin between the anterior limbs and the base of the tail. These two, *m. humero-dorsales* and *humero-abdominales*, arise separately from the humerus behind the attachment of the great pectoral muscle, and, passing respectively backwards and upwards and backwards and downwards, soon become attached to and spread out over the internal surface of the integument covering the back and sides behind the scapulæ, and the sides and the abdomen behind the umbilicus; the dorsal pair are inserted into the upper surface and sides of the base of the tail, the abdominal into the under surface and sides of the same part. Added to these, other cutaneous muscles line the integument in front of the fore limbs. Of these the chief are the *sterno-faciales*, a broad muscular aponeurosis extending upwards on either side of the neck and head from a raphe occupying the centre line of the neck beneath, and connected posteriorly by two pairs of small oblique muscles with the sternum.

The facial muscles are well developed. *Zygomaticus major* and *minor* arise from the root of the zygomatic arch; and above them a pair of similar but smaller muscles, the *levator alæ nasi* (*inferior* and *superior*) have their origin from the space between the root of

<sup>1</sup> It is especially necessary to examine the crowns of unworn teeth to see the central fifth cusp and this groove separating it from the postero-external cusp; for in most specimens the central cusp is found worn down, and its base as well as that of the postero-external cusp spread out so as to obliterate wholly or in part the intervening groove; the base of the central cusp then appears as a prolongation of the ridge which, as described above, unites it with the antero-internal cusp.

the zygoma and the margin of the orbit. All four muscles form very long and slender tendons, which pass forward horizontally parallel to one another, to be inserted respectively into the upper lip, slightly in front of the first upper incisor, into the extremity of the nose below the nasal orifice, into the middle of the *alæ nasi*, and into the extremity of the nose above the nasal orifice. Between the origins of the *zygomaticus major* and *minor* arises another muscle, the *levator labii superioris et erector vibrissarum*, which passes directly forwards between the tendons of these muscles, and terminates in a mass of muscular fibres which invest the bases of the remarkably long vibrissæ which spring from the sides of the muzzle, and is also connected with the *orbicularis oris* beneath. The *levator labii superioris proprius* is well developed, arising from the maxillary bone above, and in front of the infraorbital foramen, forming a strong tendon, which, united over the extremity of the muzzle with the tendon of the corresponding muscle of the opposite side (as in *Equus*), is inserted with it into the upper lip below the nasal orifices.

The *temporal* muscle is remarkable for its great size and peculiar development. It arises by three heads, which are all inserted into the coronoid process:—

I. From the greatly developed occipital crest and surface of the parietal bones, in the usual position of origin, inserted into the superior and anterior margin of the coronoid process.

II. From the mastoid process, root and upper margin of the zygoma along its posterior two thirds, the fibres curve upwards, forwards, and downwards, forming a semicircular muscular mass above the zygoma on the side of the head, lying against the temporal muscle proper; inserted into the outer side of the coronoid process near its base.

III. From the inner side of the posterior two thirds of the zygomatic arch a mass of muscular fibres arises, which, curving forwards, is inserted into the postero-external margin of the upper half of the coronoid process.

We have thus a series of muscular structures having an exceedingly extended origin, and of great relative development, attached to the much-expanded coronoid process of the mandible, supplying the force needed to move such greatly extended jaws; for, probably, in no other mammal are these so much developed in comparison with the size of the animal.

Not less remarkable in its development is the *digastric*. This muscle arises normally; but at the point where the tendinous intersection occurs (nearly opposite the hyoid bone) it splits into two laminae: one, superficial and external, continues forward in the usual direction of the muscle; the other, transverse, is directed inwards, and slightly forwards, its posterior free tendinous margin being a direct continuation of the tendinous intersection of the muscle, which unites in the middle line in front of the hyoid bone with that of the corresponding muscle of the opposite side, forming a tendinous raphè, from which the united muscles are



continued forwards between the rami of the mandible, concealing the greater part of the mylo-hyoid muscles (which are very thin, and do not extend beyond the middle of the intermandibular space), and are inserted laterally (under cover of and united at their insertion with the superficial laminae, but extending anteriorly for a short distance beyond them) into the sides of the jaws.

This peculiar development of the digastric has been described as an anomaly in man, but is known as a normal condition in *Chiromys madagascariensis* and in some other Primates<sup>1</sup>. The writer has found it well marked in certain species of Chiroptera, as in *Epomophorus macrocephalus* and *E. minor*, where, although the united internal laminae of the muscles extend as far backwards as to cover the hyoid bone, there is no connexion with it. It is especially noticeable in this case that the tendinous intersection is vertical, or nearly so, corresponding to the position of the posterior margin of the united muscles, as the oblique intersection in *G. rafflesii* corresponds to the more anterior position of the posterior margin of the same muscles in the latter species; and we may reasonably conclude that the tendinous intersection of the digastric, wherever met with in Mammalia—whether as a true tendon, as in the Primates, or as a mere tendinous inscription, as in many species of Chiroptera and of Insectivora—has primarily originated as the origin of a tendinous posterior raphé, such as we find in *Gymnura rafflesii*<sup>2</sup>.

The *sterno-mastoids* and *cleido-mastoids* are large, and, except at their insertions, separate; the *cleido-occipital* is united for a considerable distance with the *trapezius*, and really appears to be part of that muscle inserted into the clavicle. The *omo-hyoid* is well developed, and has the usual origin and insertion. *Levator scapulae*, from the transverse process and anterior arch of the atlas, is inserted into the extremity of the outer bifurcation of the acromion, superficial to the insertion of the trapezius, to the surface of which its posterior and upper margin is attached. The *trapezius* is double. Its occipital and cervical portion is well developed, arising from the inner three fourths of the occipital crest, from the centre line of the neck, and from one or two dorsal spines. Some of the anterior fibres separate about the middle of the neck to form the *cleido-occipital* (or is the *cleido-occipital* united at this point with the *trapezius*?); the remaining fibres are inserted into the spine of the scapula from the acromion to its posterior root. The posterior *trapezius* arises from the last five or six dorsal vertebrae, and is inserted into the posterior third of the spine of the scapula.

The *rhomboideus anticus* has the same origin as the *trapezius*, with the addition of three or four dorsal spines; it is folded at its insertion into the posterior margin of the scapula. *Rhomboideus posticus* is a small flat muscle, which passes from the spines of the fourth, fifth, and sixth dorsal vertebrae to the internal surface of the middle of the posterior margin of the scapula beneath the *r. major*.

<sup>1</sup> Owen, Comp. Anat. iii. p. 53.

<sup>2</sup> On this subject see my paper "On the Tendinous Intersection of the Digastric," Proc. Roy. Soc. March 31, 1881.

*Serratus posticus* is very largely developed; it arises by an aponeurosis from the posterior third of the ligamentum nuchæ, from the first two or three dorsal spines, and from the fascia of the back, and is inserted into all the ribs with the exception of the first three. *Serratus magnus* is also very large, consisting of a cervical and a thoracic portion, the former the united *levator anguli scapulae*. There is no distinct *splenius colli*. The *trachelo-mastoid* is large, arising by a thin muscular aponeurosis from the anterior three or four dorsal transverse processes in close connexion with the origin of the *transversalis cervicis*, also from the sixth, fifth, and fourth cervical transverse processes, and converges to form a short tendon which is inserted into the mastoid process.

*Complexus tertius*, from the articular processes of the sixth to the third cervical vertebræ, is in intimate connexion with the attachment of the *complexus major*, which lies internal to it, and is inserted into the extremity of the transverse process of the atlas. *Scalenus medius et posticus* are united, forming a large muscular mass, which arises from the transverse processes of the cervical vertebræ above the brachial plexus which separates it from the *longus colli*. The *longus colli* appears to commence from the body of the seventh dorsal vertebra (but small muscular fibres may be traced from the body of one vertebra to the other as far back as the diaphragm), and passes forwards from the body of one to the inferior lamellæ of the transverse process of the next, until it finally terminates at the atlas.

*Rectus abdominis et sternalis* is well developed throughout its whole length, extending from the first rib to the pelvic bones. The attachment of this pair of muscles to the latter is very peculiar, namely by four interlaced fleshy tendons; the left rectus divides about midway between the umbilicus and the symphysis pubis into a pair of fleshy tendons, which are directed backwards and outwards towards the right pubic bone, and go between a corresponding pair from the right rectus, passing towards the left pubic bone in such a manner that the internal division of the left rectus is superficial. This division is narrower than the others, and tendinous at its insertion.

This interlacement of the tendons of the recti forms a powerful support to the weak and narrow symphysis of the pubic bones, which must be separated at the time of parturition, as the extremely narrow diameter of the pelvis (referred to above, p. 390) is evidently quite insufficient to admit of the passage of the fœtus. It would also effectually prevent rupture of the abdominal walls in a vertical direction when the symphysis is widely separated, and ensure re-apposition of the pubic bones.

There are no distinct *lineæ transversæ*; the *obliqui externi* unite muscularly along the middle line between the sternum and the umbilicus; the *obliqui interni* are exceedingly thin and aponeurotic, which is also the condition of the former muscles behind the umbilicus, their places as supporters of the abdominal walls being evidently taken to a great extent by the cutaneous muscles, the *humero-abdominales*, and by the *recti*.

Of the muscles which are attached to the humerus, the *latissimus dorsi* is well developed; it is inserted, as usual, in connexion with the *teres major*, and gives off near its insertion a broad but thin *dorso-epitrochlearis*, which arises from its lower margin by a tendinous aponeurosis.

*Pectoralis major* is extensive in its origin. It is divisible into clavicular and sternal portions, the former from the outer half of the clavicle; the latter, from the sternum and the cartilages of the ribs, is again divided into an *anterior* and *posterior* part. The former is narrow, arising from the sternum at its anterior extremity, and from a raphe common to it and its fellow of the opposite side, which extends beyond the sternum, covering the origins of the sternomastoid muscles; each muscle passes directly outwards to its insertion into the humerus. The latter, or posterior part, is by far the largest, arising from the whole length of the sternum behind the preceding, from the sternal extremities of the costal cartilages, and from fascia connected with the sheath of the rectus; the muscular mass thus formed divides into four fasciculi, two *superficial* and two *deep*: the former are inserted into the middle third of the humerus; of the latter the anterior or smaller fasciculus (*m. sterno-clavicularis*) is inserted into the greater part of the outer third of the clavicle, the posterior or larger into the greater tuberosity and neck of the humerus.

The peculiar anomaly of the same muscle being inserted into and also arising from the same bone, suggests whether the so-called clavicular part of the great pectoral should not be considered a separate muscle, which might be termed *claviculo-humeralis*.

The very complete separation of the anterior division of the sternal part of the muscle from the other parts, and the united origins of the muscles of the opposite sides which compose this part, and which extend for a considerable distance beyond the anterior extremity of the sternum, recall the well-known similar conditions in *Talpa*.

The *teres major* is well developed; but there is no trace of a *teres minor*. The *triceps* is enormous in comparison with the size of the animal; it arises by three heads, a scapular and two humeral. The *biceps* arises by a single head from the scapula above the glenoid cavity, and is inserted into the *ulna*; the *brachialis anticus*, on the other hand, is inserted into the *radius*. There is no trace of either *coraco-brachialis longus* or *brevis*.

Of the forearm-muscles the *supinator longus* is absent, the *supinator brevis* present but very small; the *pronator radii teres* is inserted by a broad muscular expansion into the middle part of the lower third of the radius; the *extensor digitorum communis* and the *extensor minimi digiti* are united in the arm, the muscular mass dividing into two tendons, which cross the carpus, the smaller of these representing the tendon of the latter muscle, being distributed by slips to the fifth and fourth digits; the larger divides into four, which are distributed to the three middle toes. The *extensor secundi internodii pollicis et extensor indicis* is small, arising by a

few muscular fibres from the interosseous ligament and adjoining surfaces of the ulna and radius.

The *palmaris longus* arises in common with the *flexor carpi ulnaris* and *flexor digitorum sublimis*, and forms a thin flat tendon which, passing down alongside and internal to that of the former muscle, is inserted into the palmar fascia. The *flexor digitorum sublimis* arises as above described, and is also connected with the origin of the *pronator radii teres* and the *flexor digitorum profundus*, and divides in the manus into three tendons for the three middle toes. *Flexor digitorum profundus* arises by five heads, which unite into a common tendon, which in the manus divides into tendons for each of the five toes. There are four *lumbricales*, inserted respectively into the inner sides of the bases of the first phalanges of the four outer toes.

Of the muscles attached to the hind limbs the *psoas magnus* and *psoas parvus* are both well developed and nearly equal in size. Their tendons, passing backwards, unite with the outer and inner sides respectively of the fleshy tendon of the *iliacus*, and are, with it, inserted into the lesser trochanter.

The *quadratus lumborum* is remarkable for its rudimentary form and interrupted connections. It arises as a small bundle of muscular fibres from the side of the fifteenth dorsal vertebra, and from the surface of part of the last intercostal muscle, forms four slender tendons, which are attached respectively to the tips of the long transverse processes of the second to the fifth lumbar vertebra; the tip of the sixth vertebra receives its tendon from a separate bundle of muscular fibres, which are attached to the inferior surface of the fourth transverse process; and other fibres, arising from the posterior margin and inferior surface of the fifth transverse process, pass backwards to the crest of the ilium, a large part uniting with the *iliacus* muscle. Thus the four muscles, the *psoas magnus* and *p. parvus*, the *quadratus lumborum* and the *iliacus*, may all be said to be the same muscle, having various origins but the same insertion. This muscle may be considered a differentiated intercostal<sup>1</sup>, to which the name *m. costo-ileo-femoralis* might be applied.

The *sartorius* is represented by a muscular aponeurosis, which covers the muscles on the inner side of the thigh connected with the fascia covering the *iliacus* muscle, and more internally with the pectineal eminence by a slender muscle which arises therefrom, inserted along the prominent ridge on the anterior surface of the tibia. The *semitendinosus* is also peculiar in its connections. It arises partly from the *tuber ischii*, and partly from a dense tendinous aponeurosis attached across the upper surface and sides of the tail, by which it is connected with the corresponding muscle of the opposite side. It consists of two laminae, which unite and again divide; the outer division, smaller, passes outside the leg, and, becoming united with the lower margin of the *biceps flexor cruris*, is inserted with it into the tibial ridge; the inner, the *m. semitendinosus* proper, is inserted into the inner side of the same ridge. The leg, there-

<sup>1</sup> See Dr. Gadow's paper in *Morpholog. Jahrbuch*, 1881, pp. 57-100.

fore, is enclosed in a sling formed by the two divisions of this muscle.

The *solæus* is well developed, but arises by a short tendon from the head of the fibula only. *Extensor hallucis longus*, from the middle of the tibia beneath the large *tibialis posticus*, is very small; but the *extensor digitorum longus*, which arises by a tendon from the external condyle of the femur, is moderately developed. The *peronei* muscles arise together from the head of the fibula, but divide at once into the *p. brevis*, *longus*, and *quinti digiti*; the tendons of the latter are inserted into the distal phalanges of the fourth and fifth toes respectively.

The *plantaris* is well developed, arising by two heads from the external condyle. Its tendon becomes at the heel superficial to that of the *tendo Achillis*, over the insertion of which it glides, and, passing into the sole of the foot, gives origin altogether to the *flexor digitorum brevis*, and becomes connected with the plantar fascia. The *flexor digitorum longus* and *flexor hallucis longus* are inseparably united.

The *tibialis posticus* is represented by two separate muscles, one having its origin from the tibia, the other from the fibula, and which may therefore be described as the internal and external divisions of this muscle. The latter, the *tibialis posticus externus*, is very slender; arising from the head of the fibula internally, it forms a long and slender tendon, which, passing down on the inner side of the tibia with the tendon of the external division, is inserted into the scaphoid bone. The internal division, *tibialis posticus internus*, is much larger; arising from the head of the tibia, and from half the length of the bone by a fascial aponeurosis, it forms also a long tendon, which extends along the side of the foot between the integument and the plantar fascia, and, spreading out, is inserted round the base of the central callosity of the integument.

It is remarkable that the first described of these muscles has the insertion usually observed in the *tibialis posticus* of other mammals, while the latter has the origin of that muscle, but not its insertion. The action of this latter muscle is evidently to fix the central callosity of the sole of the foot, and so assist progression on smooth or inclined surfaces.

*Flexor digitorum brevis* arises, as above described, from the tendon of the *plantaris*, and is not connected with the os calcis; it divides into five flat tendons, which form the perforated tendons for the five toes. The *flexor accessorius* is well developed; arising from behind the prominent bony tubercle on the os calcis which supports the tendon of the *peroneus longus*, it is inserted obliquely into the outer side of the *flexor digitorum longus* tendon, opposite the base of the fifth metatarsal bone. There are, as in the manus, four *lumbricales* for the four outer toes, and with similar attachments.

The palate is marked by eleven ridges, all simple and undivided; the first corresponds to the space between the first and second incisors, the second to the canines and first premolars, the third to the second premolars, the fourth to the third premolars. The ton-

sils consist each of a deep oval depression with raised edges, partly concealed by a membranous fold in front, so that the opening of the depression is directed backwards towards the pharynx. Tongue moderately long and obtusely pointed, soft and flexible, covered all over with fine trifid papillæ, each consisting of a long central filiform papilla having a shorter and more slender papilla at either side;

Fig. 2.

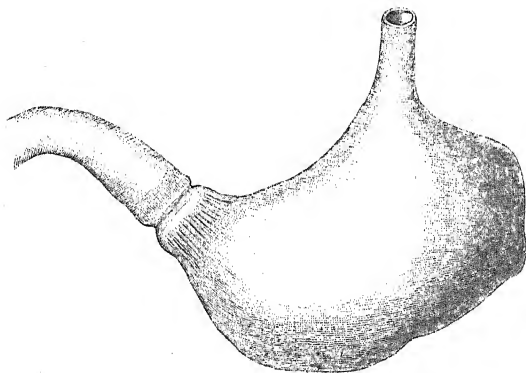
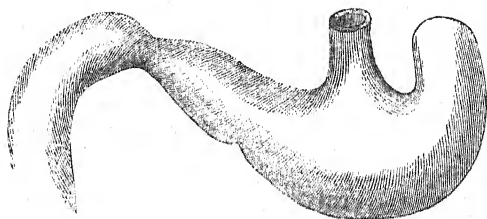
Stomach of *Gymnura rafflesii*.

Fig. 3.

Stomach of *Erinaceus europæus*.

fungiform papillæ few but conspicuous; circumvallate papillæ two only, very large, elongated, in deep oval pits placed obliquely at the back of the tongue; beneath, close to the symphysis menti, at the anterior extremity of the floor of the mouth, are a pair of long pointed papillæ, at the bases of which the apertures of the ducts of the submaxillary glands open. The latter are rather small, consisting each of a small anterior and a large posterior lobe; the duct, passing between the digastric muscle and the ramus of the mandible,

and curving forwards, under cover of the *mylo-hyoid* and *genio-hyoglossus* muscles, passes along under the mucous membrane of the floor of the mouth, opening at the base of the above-noticed papilla. In the specimen examined there was no trace of sublingual glands. The parotids are larger than the submaxillaries, but very similar to them in structure.

The stomach (fig. 2) resembles that of man in general outline; the œsophagus enters it by a narrow orifice far removed from the pylorus. The cardiac portion has the mucous membrane thrown into very deep rugæ, which extend from the entrance of the œso-

Fig. 4.

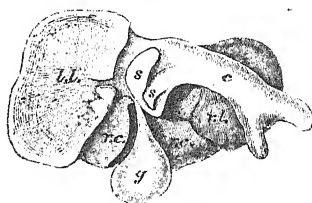
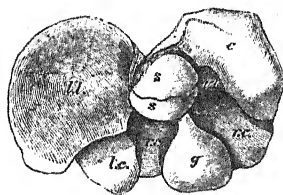
Liver of *Gymnura rafflesii*.

Fig. 5.

Liver of *Erinaceus europæus*.

phagus. The intestinal canal is about six times the length of the head and body, of nearly the same calibre throughout, without cæcum, and suspended typically in the mesentery. The liver (fig. 4) is wide and deeply divided into lobes; the spigelian lobe bifid, the caudate very long, divided at its posterior extremity by the deep renal fossa; umbilical and cystic fissures well marked; the gallbladder large and pyriform, projecting considerably beyond the margin of the right central lobe, on which it is placed.

The lungs (fig. 6) are large and deeply divided into lobes, the right lung into three, the fissures extending to the root of the lung, the left into two nearly equal lobes; the azygos lobe well developed and pyramidal in outline.

Bladder small, pyriform, the ureters opening by longitudinal slits close to the neck, and three fourths of an inch from the extremity of the urethra in the female.

Fig. 6.

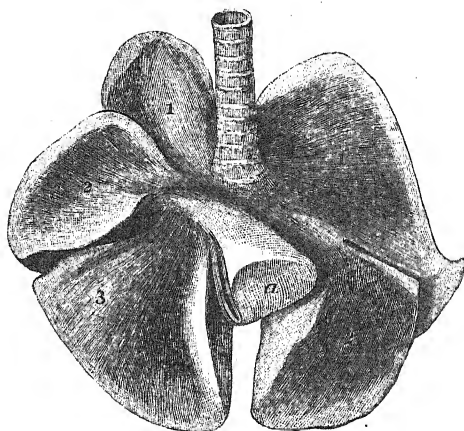
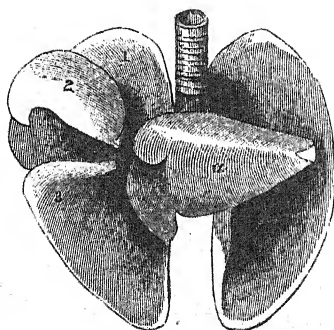
Lungs of *Gymnura rafflesii*, half nat. size.

Fig. 7.

Lungs of *Erinaceus europæus*, half nat. size.

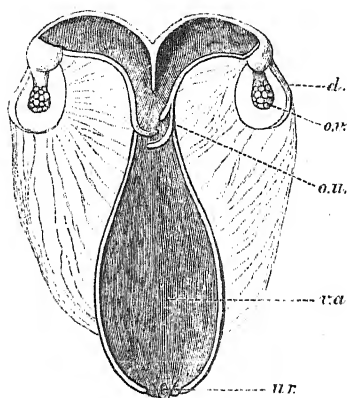
The uterus<sup>1</sup> is almost double, the cornua uteri extending nearly to the os uteri; and there is no true corpus uteri. In both specimens examined there was found a peculiar fleshy hood, extending

<sup>1</sup> Both specimens of this species examined were females; the writer has not yet had an opportunity of dissecting a male.



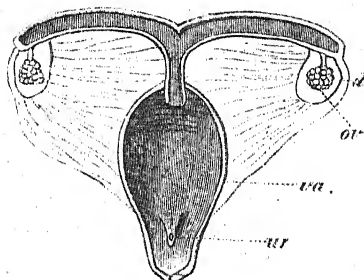
over the os uteri, the lateral opening of which at first appeared to be the os (see fig. 8); on dividing this the true os was found to have been concealed in its deep recess. The ovaries are botryoidal, and enclosed in peritoneal sacs.

Fig. 8.



Uterus and vagina of *Gymnura rafflesii* (horizontal section).

Fig. 9.



Uterus and vagina of *Erinaceus europæus* (horizontal section).

On either side of the rectum a large preanal gland, about the size of half a walnut, is found, invested externally with circularly disposed muscular fibres, and its cavity lined internally with a glandular membrane having several deep lacunæ, and filled with a large quantity of a friable brown substance. The openings of these glands are small and circular, placed immediately in front of the anterior margin of the anus.

Genus *ERINACEUS*, L.

In the form of the head and body all the known species agree together remarkably closely; and, as might be expected, the anatomy of these parts is much the same throughout the species; but the limbs, being nearly free from the great panniculus carnosus (which as it were moulds the shape of the parts included within it), vary very considerably in form and relative length of parts; and this variability is accompanied by differences in their internal structure not less remarkable than have been observed between the species of some other genera of Mammalia less closely allied by general external similarity of form.

The anatomy of the following twelve species has been examined by the writer:—

Palæarctic Region	{	1. <i>E. europæus</i> , L.
		2. <i>E. concolor</i> , Martin.
		3. <i>E. algirus</i> , Duvernoy.
		4. <i>E. deserti</i> , Loche.
Ethiopian Region ..	{	5. <i>E. macracanthus</i> , Blanford.
		6. <i>E. diadematus</i> , Württ.
		7. <i>E. heterodactylus</i> , Sund.
Oriental Region ..	{	8. <i>E. micropus</i> , Blyth.
		9. <i>E. pictus</i> , Stoliczka.
		10. <i>E. grayii</i> , Bennett.
		11. <i>E. blanfordi</i> , Anderson.
		12. <i>E. niger</i> , Blanford.

These species sufficiently represent the genus; other known forms will be found to be closely related to one or other of them.

With the exception of the head and tail, the skeleton of any species of *Erinaceus* (for all resemble one another closely) resembles that of *Gymnura* with all the processes of the vertebræ shortened and the prominences of the other bones rounded off. The form of the skull differs considerably: it is altogether shorter and broader than in that genus; the brain-case is comparatively more capacious, and the occipital crest much less developed. In other respects, however, there is much similarity; and the dentition is evidently but a modified form of that of *Gymnura*. If the dental formula of the latter be represented as follows:—

$$i. \frac{3-3}{3-3}, c. \frac{1-1}{1-1}, pm. \frac{4-4}{4-4}, m. \frac{3-3}{3-3} = 44 \text{ teeth,}$$

then that of *Erinaceus* is

$$i. \frac{3-3}{2-2}, c. \frac{1-1}{1-1}, pm. \frac{3-3}{2-2}, m. \frac{3-3}{3-3} = 36 \text{ teeth.}$$

By modifying the usual manner of writing the dental formula, the homologies<sup>1</sup> of the teeth of the latter with those of the former genus may be thus graphically expressed:—

<sup>1</sup> As determined by the writer on grounds which are fully stated in the work referred to in note to p. 389.

*Gymnura.*

$$i. \frac{6=(2a+2b+2c)}{6=(2a'+2b'+2c')}, c. \frac{2=(d+d')}{2=(d'+d')}, pm. \frac{8=(2e+2f+2g+2h)}{8=(2e'+2f'+2g'+2h')}, m. \frac{6=(2i+2j+2k)}{6=(2i'+2j'+2k')}.$$

*Erinaceus.*

$$i. \frac{6=(2a+2b+2c)}{4=(2a'+2b')}, c. \frac{2=(d+d')}{2=(d'+d')}, pm. \frac{6=(2f+2g+2h)}{4=(2f'+2h')}, m. \frac{6=(2i+2j+2k)}{6=(2i'+2j'+2k')}.$$

Fig. 10.

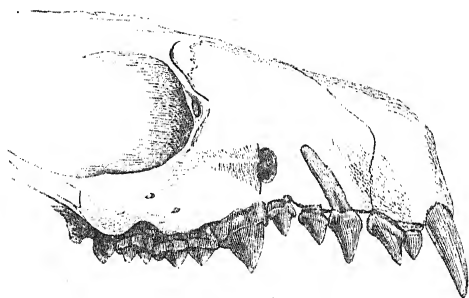
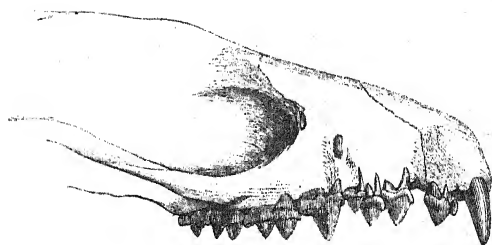
Skull of *E. europæus*<sup>1</sup>.

Fig. 11.

Skull of *E. blanfordi*<sup>1</sup>.

<sup>1</sup> These drawings show how remarkably *E. europæus* differs in the form and relative size of its second and third upper incisors and first upper premolars from the other species of the genus, which resemble one another very closely in the form and relative size of their teeth.

It will thus be seen that *Erinaceus* differs in wanting the third lower incisor, and the first upper and lower, and third lower premolars. The first tooth behind the premaxillary suture is undoubtedly the representative of the corresponding tooth in *Gymnura*, which, although provided with two roots, must be regarded as a canine, having not only the position but also the form of that tooth in Carnivora. This tooth in *Erinaceus* has, as a rule, two roots also; but occasionally, especially in *E. europæus* and its varieties, these grow together; and in a skull in the British Museum (see above, fig. 10) the canine has a single long root which extends upwards and backwards over the premolars. The second upper premolar is the most variable tooth: in most species it has three roots with a triangular crown, having its longest horizontal diameter transverse; in *E. micropus* and *E. pictus*, on the other hand, it has a single root and a circular crown, is external to the tooth-row, and deciduous in the adult animal. It reaches its highest development in *E. europæus*, its lowest form in *E. micropus*, which species is further characterized by the imperfection of the zygomatic arch, owing to the absence of the malar bone. The first and second upper molars have precisely the same pattern of crown as described above (p. 391) in *Gymnura*; but their peculiar form must be studied in young animals while these teeth are still unworn, as the acutely-pointed cusps quickly disappear as the age of the animal increases: the third molar is much narrower than in *Gymnura*, and, in common with the others, scarcely varies in shape throughout the species. In the lower jaw the greatest similarity prevails in the shape of the teeth between even the most widely separated species; but, except in the form of the first and second molars (as in the upper jaw), no resemblance can be traced between them and those of *Gymnura*.

The vertebral column is made up of 7 cervical, 15 dorsal, 6 lumbar, 7 sacro-coccygeal, and 5 or 6 caudal, succeeded by a variable number of rudimentary vertebræ. It is especially noteworthy that, with the exception of the caudal vertebræ, the number of the other divisions corresponds exactly to those of *Gymnura*. The vertebræ differ, however, in the very short condition of the spinous and transverse processes, none of them, except the spinous process of the axis and the inferior lamellæ of the transverse process of the sixth cervical vertebra, approaching those of *Gymnura* in size; and the cervical vertebræ have no trace of the hypapophysial spines so prominent in that genus. Of the seven sacro-coccygeal vertebræ, the three anterior are firmly ankylosed together, and articulated with the iliac bones, so that one vertebra more enters into the articulation, and a much more perfect sacrum is formed, than in *Gymnura*. The short caudal vertebræ show their fundamental similarity of structure with those of *Gymnura* by the presence of similar but rudimentary chevron bones. As in that genus, there are fifteen pairs of ribs (in *E. deserti* fourteen only); but the thorax is comparatively much less capacious, these animals seeking protection from their defensive armour, not from speed in making their escape. The sternum is similarly narrow and bilobate in front, but differs in

the shortness of the xiphisternum; and the mesosternum is made up of three or two segments only.

The pelvic opening contrasts remarkably with that of *Gymnura*; its transverse diameter, measured between the acetabula, is nearly or quite half its longitudinal, whereas in *G. rafflesii* it is scarcely one ninth; the symphysis pubis is also much deeper, especially in *E. europæus*; the tuber ischii is short and rounded off; and the posterior margin of the ramus of the pubis and ischium is convex, not concave.

Except in *E. europæus* and its varieties, there is a supracondylar foramen in the humerus. The carpus is formed on the same plan as in *Gymnura*; but the scaphoid and lunar bones are early united, leaving no trace of their original separate condition. In the femur the convexity which in *Gymnura* represents a third trochanter is less prominent and more extended, indicating a long muscular, as opposed to a tendinous, insertion of the muscles attached to it, and pointing to the less active habits of the animals. Other limb bones, both in the anterior and posterior legs, are generally similar to those of *Gymnura*, a single departure from the typical number of five digits in the fore and hind feet being seen in *E. heterodactylus* and its varieties, where the hallux is altogether wanting.

In the muscular anatomy the chief differences between the species of this genus and *Gymnura* are found in the much greater development of the panniculus carnosus, and in other minor points to be noticed further on.

To the cutaneous muscles described in *Gymnura rafflesii* there are in all the species of *Erinaceus* others superadded, which are related to the well-known defensive attitude assumed by these animals when frightened. They have been figured in the anatomical plates of Cuvier and Laurillard<sup>1</sup>, and described by Prof. Huxley<sup>2</sup>.

In the general myology the following differences are especially noticeable:—

In the face the *zygomaticus major* is inserted into the *orbicularis oris* and integument of the upper lip at a short distance in front of the angle of the mouth. The *temporal* muscle arises also from the zygomatic arch, as in *Gymnura*; but its fibres do not take origin so far back as the mastoid process. The *diaphragic* is single, and does not unite with its fellow of the opposite side between the jaws; it has nearly the same calibre throughout, but is crossed about the middle by an oblique tendinous inscription, corresponding precisely in position to the tendinous intersection in *Gymnura*. The *mylohyoid* is well developed, consisting of an anterior and posterior portion. *Cleido-occipital* is slender and quite unconnected with the *trapezius*. The *serratus magnus* is not united with the *levator anguli scapulae*.

The *pyramidales* are well developed, in striking contrast with *Gymnura*, in which they are rudimentary or absent. The *recti abdominis et sternalis* are connected with the pubic bones by three instead of four tendons, the missing tendon corresponding to the

<sup>1</sup> Planches de Myologie.

<sup>2</sup> Anat. Vert. Animals, p. 445.

most superficial of the four in *Gymnura*, while the least superficial of the three is much smaller than the others. This smaller number of tendons, and evident tendency towards still further reduction, appears to be related to the greater depth of the symphysis pubis, and consequently greater union of the bones of opposite sides, as well as to the lessened proclivity to their separation, owing to the greater transverse diameter of the pelvic opening, which is probably quite sufficient to freely permit of the passage of the foetus during parturition.

*Quadratus lumborum* is much larger and more fleshy than in *Gymnura*, extending without interruption from the last intercostal space and base of last rib to the crest of the ilium, inserted successively by small tendons into the extremity of each lumbar transverse process. *Psoas magnus* and *psoas parvus* are large; but the latter is inserted into the anterior sacro-iliac ligament and into the margin of the pelvis.

The *pectoralis major* has no separate anterior sternal part, as in *Gymnura*; nor has its deep lamina any insertion into the clavicle. The *coraco-brachialis*, which is altogether wanting in that genus, is well developed here, and consists of two parts:—the superficial, a long slender muscle inserted into the lower third of the humerus; the deep (*coraco-brachialis brevis*), short, and inserted below the lesser tuberosity. There is a small *teres minor*, but, as in *Gymnura*, no trace of the *supinator longus*. The *palmaris longus* is large, with a distinct tendon, which, passing downwards internal to that of the *flexor carpi ulnaris*, becomes superficial to it, and glides over the prominent pisiform bone (to which the latter is attached) into the hand, becoming there connected with the palmar fascia, and giving origin wholly or in part to the *palmaris brevis*, from which is derived the *flexor perforatus* for the pollex and outer finger, the *flexor sublimis digitorum* supplying the three middle toes only. *Lumbricales*, when present, are rudimentary, and connected with the third and fourth digits only.

In the hind limbs the *sartorius*, so feebly developed in *Gymnura*, is represented by two strong muscles:—one from the fascia covering the *iliacus* and from the margin of the pelvis in front of the acetabulum; the other, as large, from the margin of the pelvis lower down, midway between the acetabulum and the symphysis pubis. Both are inserted into the tibia, the first above the second, below the attachment of the internal lateral ligament of the knee-joint.

These two well-developed muscles are evidently the differentiated representatives of the muscular aponeurosis covering the adductors, and of the small muscle which joins it from the pectineal line in *Gymnura*.

The *semitendinosus* arises simply from the tuber ischii, and is inserted into the tibia behind the tendon of the *gracilis*; it has no connexion with the *biceps flexor cruris*. *Extensor digitorum longus*, as in *Gymnura*, arises from the external condyle of the femur, and supplies tendons to the four outer toes; these vary considerably in number, arrangement, and connections with other tendons. The

*peronei* muscles are quite similar to those in *Gymnura*, but vary very much in the different species in their modes of origin and connections with the tendons of other muscles. *Plantaris* is well developed; and its tendon passes into the sole of the foot precisely as in *Gymnura*; but in some species the *flexor digitorum brevis* has also a calcaneal origin. The *tibialis posticus* is represented, as in *Gymnura*, by a pair of muscles in *E. europæus*, *concolor*, *macracanthus*, *niger*, and *blanfordi*; the internal muscle, however, is much smaller than in that genus, and arises from the head of the tibia only, and is altogether wanting in *E. deserti*, *algerius*, *pictus*<sup>1</sup>, *heterodactylus*, and *diadematus*, which have the centre callosity of the sole of the foot rudimentary or absent.

*Flexores digitorum et hallucis longi*, although united into a single tendon before crossing the ankle-joint, are easily distinguishable in the leg. In the foot this tendon (in *E. macracanthus*, *niger*, *blanfordi*, *pictus*, *micropus*) is joined by a *flexor accessorius* arising from the os calcis. *Lumbricales* exist in *E. europæus*, *concolor*, *grayi*, *macracanthus*, and *micropus*, but are represented by one or two very small muscles connected with the deep flexor tendons for the third and fourth toes, or, as in *E. micropus*, for the second toe only. *Flexor digitorum brevis* (noticed above), in the long-toed species, as *E. europæus*, *concolor*, *macracanthus*, *blanfordi*, *niger*, arises almost wholly from the expanded tendon of the plantaris; in the short-toed, as *E. micropus*, *heterodactylus*, *diadematus*, it is also largely connected with the fibrous aponeurosis, attaching the sides of the *plantaris* tendon to the os calcis, and a few fibres arise directly from the bone itself; but nearly all the muscular fibres arising from the os calcis external to the tendon of the deep flexor really belong to the *abductor ossis metacarpi minimi digiti*.

Many other points of great interest are noticeable in the muscular anatomy of the species of the genus *Erinaceus*, which will be found treated of in the work from which these notes are taken (referred to in the footnote to the first page of this paper), which the writer hopes soon to publish.

As might be expected from the comparatively much shorter jaws of the species of *Erinaceus*, the palate-ridges are less in number than in *Gymnura*, being nine only. The tongue is similar in general appearance; but the filiform papillæ are bifid, and there are three circumvallate papillæ; tonsils comparatively small, the depression shallow and vertical, opening outwards and backwards.

The digestive organs in the Common Hedgehog have been described by Prof. Flower<sup>2</sup>. They probably more closely resemble those of *G. rafflesii* than do those of any of the other species of the genus. The chief differences observable are in the shape of the stomach (fig. 3, p. 398), which has the cardiac extremity more expanded

<sup>1</sup> Probably absent in *E. micropus* also; but the specimens of that species examined had had the upper parts of the legs removed.

<sup>2</sup> Lectures on the Comparative Anatomy of the Organs of Digestion of the Mammalia, by W. H. Flower, F.R.S., Hunterian Professor. Publ. in 'Medical Times and Gazette,' 1872, ii. p. 2.

upwards and to the left side; and in the liver (fig. 5), which has a much shorter and thicker caudate lobe (as indeed might be expected in a comparatively much shorter animal). But very considerable variability in the forms of both these organs is observable in the different species, no two species agreeing closely. The intestinal canal, however, in length and in its general construction is very similar throughout the whole family.

The lungs are constructed very much on the same plan as in *Gymnura*; but they are comparatively smaller, as might be expected in animals depending on their armour, and not on their speed, in making their escape when attacked by enemies. The right lung is divided more or less completely into three lobes; but the left is quite undivided; the azygos lobe is well developed and pyramidal in outline, the apex of the pyramid, not the base, as in *Gymnura*, being at its lower extremity (fig. 7, p. 400).

The *uterus* (fig. 9, p. 401) scarcely differs in form throughout the species. It exhibits an advance in development; for, although the cornua are even longer than in *Gymnura*, there is a true corpus uteri, into which they open at right angles. The os uteri is not enclosed in a hood, as in *G. rafflesii*; but one or two deep folds occupy the uterine extremity of the vagina, which are so large that, as John Hunter remarked, they appear at first as if they were the os uteri<sup>1</sup>.

A review of the anatomy of the species of *Erinaceus* not only adds valuable aid in attempting their systematic arrangement, but also, when we compare it with that of *Gymnura*, leads to the conclusion that they are but differentiated forms of some animal of which we have very probably a close representative in *G. rafflesii*, which we may expect will be hereafter proved to be a very ancient form, perhaps one of the sole survivors of a once widely extended group of predaceous Insectivora.

#### EXPLANATION OF THE WOODCUTS.

Fig. 1. Crown of first upper molar, right side, of *Gymnura rafflesii*, showing the fifth central cusp, which is connected by a  $\Delta$ -shaped ridge with the bases of the two internal cusps.

2, 3. Stomach of *Gymnura rafflesii* and of *Erinaceus europæus* (reduced).

4, 5. Posterior surfaces of livers of the same species (much reduced).

6, 7. Lungs of the same species, from below, half natural size.

8, 9. Uteri and vaginæ of the same species. The uterus of each is shown in section; the vaginal walls are divided and reflected. The different positions of the urethral aperture (*ur*) in the two species is noticeable, and the presence in *G. rafflesii* of a hood concealing the os uteri (*ou*).

10, 11. Anterior halves of the skulls of *Erinaceus europæus* and *E. blanfordi* (enlarged).

Figures 1, 10, 11 are from enlarged drawings by Mr. Mintern, from specimens in the collections of the British Museum and of Mr. W. T. Blanford, F.R.S.; figures 2-9 have been reduced by Mr. Smit from drawings by the author.

<sup>1</sup> As no specimen of a male *Gymnura* has yet been obtained for examination, the male organs of *Erinaceus* are not referred to here; they will be found fully described in the work referred to on p. 389, as well as all other parts which have been but cursorily touched upon or are not described in this abstract.



March 15, 1881.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1881 :—

The total number of registered additions to the Society's Menagerie during the month of February was 60, of which 1 was by birth, 24 by presentation, 23 by purchase, 2 by exchange, and 10 were received on deposit. The total number of departures during the same period, by death and removals, was 95.

The most noticeable additions during the month of February were as follows :—

1. A female Bactrian Camel (*Camelus bactrianus*), formerly belonging to Ayoub Khan, which Col. O. H. St. John, F.Z.S., has purchased from its capturers at Kandahar and presented to the Society.

2. A male Wild Sheep, obtained from Afghanistan, and presented to the Society by Capt. W. Cotton, F.Z.S. I had at first registered this animal as *Ovis cycloceros*, not knowing where else to refer it, although it obviously deviated somewhat in the more open and backward curvature of the horns from the ordinary character of that species. But Mr. Blanford has pointed out to me that it clearly belongs to the Afghan form of this species, lately described and figured by Mr. Hume as *Ovis blanfordi*<sup>1</sup>.

Mr. R. Bowdler Sharpe exhibited a specimen of the so-called Sabine's Snipe (*Scolopax sabinii*, Vigors), which had been shot by the Hon. W. W. Palmer, at Woolmer Pond, near Selbourne, Hants. This form was now well understood to be a melanoid variety of the Common Snipe (*Gallinago scolopacina*).

Mr. A. G. More exhibited some eggs of the Red-necked Phalarope (*Phalaropus hyperboreus*), believed to have been taken in England, and an egg of the Tree-Pipit (*Anthus arboreus*), taken near Dublin, this bird having been considered only doubtfully Irish. Mr. More also exhibited a specimen of the Red-crested Pochard (*Fuligula rufina*), obtained near Tralee, being the first instance on record of the occurrence of this species in Ireland.

The following papers were read :—

<sup>1</sup> J. A. S. B. xlv. pt. 2, p. 327 (1877).

1. Observations on the Characters of the Echinoidea.—IV.  
The *Echinometridæ*; their Affinities and Systematic  
Position. By F. JEFFREY BELL, M.A., F.Z.S., Professor  
of Comparative Anatomy in King's College, London.

[Received February 24, 1881.]

In continuation of the observations which I have already had the honour of bringing before the Society, I enter on this occasion into an account of some of the characteristics of what is, perhaps, the most difficult group of all the Echinoidea. The remarkable, though only apparent, asymmetry of the test of some of the Echinometridæ can only receive its rational explanation from the results of developmental studies; it is not, however, idle to prepare for these by giving some definite information as to the parts and proportions of the constituent tests.

The genus *Echinometra*, with the asymmetrical forms allied thereto, *Heterocentrotus* and *Colobocentrotus*, have, by the almost universal consent of naturalists, been closely associated one with another; and there is as yet no evidence which would justify us in offering any real opposition to these views. On the other hand, when we come to investigate the kind, and to weigh the amount and value, of the characters which have led to the union just mentioned, we find them to be slighter than this universal consent would have inclined us to imagine.

It is not necessary to recapitulate the history of the group; the publication of a Revision should save us from that, where we feel enabled to follow it; and I purpose, therefore, to begin with what students of the Echinoidea look upon as the starting-point of their future labours.

In the latest 'Revision of the Echini,' the family "*Echinometradæ*"<sup>1</sup> is accepted with very much the same kind of limitations as were suggested in 1855 by Dr. Gray<sup>2</sup>, who grouped his sixth family thus:—

#### Fam. 6. ECHINOMETRADÆ.

Ambulacral area only half as wide as the interambulacral area; ambulacral pores in groups of four or more, forming an arched series round the ambulacral tubercles.

##### A. Body circular.

1. *Strongylocentrotus*.

##### B. Body oblong.

2. *Echinometra*.
3. *Holo*[i. e. *Hetero*]centrotus.
4. *Colobocentrotus*.

<sup>1</sup> Where Gray or Agassiz are quoted the term *Echinometridæ* is spelt as they spelt it; in other places a spelling which, as I humbly imagine, is more correct, is followed.

<sup>2</sup> P. Z. S. 1855, p. 37.

As subgenera of *Strongylocentrotus*, Prof. Alex. Agassiz includes *Sphærechinus* and *Pseudoboletia*, the former of which Dr. Gray would appear to have included with *Echinus* in his fifth family, while the latter is a genus of which no species was then known. *Echinostrephus* had not, in 1855, been distinguished from *Echinus* or *Psammechinus*; while *Stomopneustes*, under the title of *Heliocidaris*, was also regarded by Gray as closely allied to *Echinus*. Of the nine genera, or subgenera, found in the family of the Echinometradæ of Agassiz, viz. (1) *Colobocentrotus*, (2) *Heterocentrotus*, (3) *Echinometra*, (4) *Parasalenia*, (5) *Stomopneustes*, (6) *Strongylocentrotus*, (7) *Sphærechinus*, (8) *Pseudoboletia*, (9) *Echinostrephus*, the first three and the sixth alone fall into Gray's family, the fourth and the eighth were unknown to science, while a different view was taken as to the affinities of *Stomopneustes*, *Sphærechinus*, and *Echinostrephus*. They were regarded, in fine, as being more closely allied to *Echinus*, because they have the "ambulacral area half as wide as the interambulacral area, with two (or three) close series of double pores, placed in threes; buccal membrane naked; body circular."

We may dismiss the first character, without even examination; for, while it is obviously artificial, it is the same for Gray's two groups of Echinidæ and Echinometradæ. As to the second difference, the arrangement of the pores, there can be little doubt that, judging by it only, *Stomopneustes* has a much closer affinity to the Echinometridæ than to the Echinidæ. And we now come to what is really the kernel of the whole matter. How far is Desor's division into *Oligopori* and *Polypori* natural? and how far is it artificial?

If we examine one of the least modified of the Echinidæ, *e. g.* *Cidaris tribuloides*, we find that the pores of the ambulacral zones are arranged regularly and equally in pairs, are, in effect, set one behind another in a straight line, and belong each to a single simple plate. If we take a more modified form, such as a species of the restricted genus *Echinus*, we find the pairs of pores have, for the greater part of the test, come to be set in arcs of three; and on close examination it is seen that the plates connected with these pairs of pores are not all of the same size, and that the primary plates fuse to form a secondary plate<sup>1</sup>.

This is the typical arrangement among the *Oligopori*; but it by no means holds for all the plates; those nearest the apical area have, more or fewer, the pairs of pores in just as straight lines as *Cidaris tribuloides*.

Taking, as an example of the *Polypori*, *Echinometra subangulata*, we have some six pairs of pores arranged in a much more elaborate arc, and the changes that come to be effected are so great that what form really the distal pair of pores of one arc seem to be the proximal pair of the succeeding arc.

<sup>1</sup> It seems to me that all the advantage lies in continuing to use the nomenclature of Johannes Müller, and to speak of the first or simple plates as *primary*, and the fused plates as *secondary*; for reasons which, no doubt, are excellent, Prof. Alex. Agassiz has (*op. cit.* pp. 642, 643) elected to reverse this nomenclature, and to speak of the compound plate as the primary one.

Turning now to the mode by which these pores come to be so arranged in the adult, it will be well to recapitulate shortly the present state of our knowledge concerning it. This knowledge has, within the last decade, been very considerably advanced by the elaborate and beautiful researches of Prof. Lovén<sup>1</sup>. I shall depart from a strict following of his account only in using the term "secondary plate" as a translation of his "plaque composée." As has been already pointed out, these secondary plates, when developed, are made up of three or more primary plates. Now, "the primary ambulacral plates of the Echinidæ are either entire (that is to say, they occupy the whole of the distance between the interrarial area and the median suture of the ambulacrum", or, in other words, extend from the interrarial area as far as the middle of the entire plates), or they end by a more or less sharp point. The major primary plates of the peristome forming the series Ia . . . Vb, most often consist, in very young individuals, of a first entire primary, of a median primary half plate, and of a third entire primary plate." In an appended table the learned author shows the arrangement of the entire and half plates in the several secondary plates of the corona of a small specimen of *Toxopneustes (Strongylocentrotus) drobachiensis*. The fourth or fifth of these has two complete and three half primaries, as is shown by the formula—1, (2, 3, 4), 5.

Next we come to the mode of growth of these different primary plates. "Near the aboral edge of a complete composite plate there is deposited the first primary plate of the new plate, then the second, and soon. All the primary plates, and even the half-plates, are primitively entire plates; *that is to say, they extend from the interrarial area as far as the median suture of the ambulacrum*". Later on, and during the period in which the entire collection of primary plates constituting the composite plate goes on enlarging, and even before it is completed by the last primary plate, the intermediate plates cease to grow; and while retaining their position on the edge of the ambulacrum, beside the interrarial area, they shrink at their extremities, which become separated from the median suture. They consequently become cuneiform. Of these intermediate plates the smallest is always that which is formed first; those which are formed later are always successively larger, whence it follows that the whole group of intermediate primary plates takes the form of a triangle, the apex of which, in the middle of the composite plate, only consists of the projecting extremity of the latest of them. It clearly results from all this, that these intermediate plates are in no way of a more recent origin than the others, that they are neither secondary nor intercalated, but that they are successively formed, after the first entire plate, and before the last;" and Johannes Müller taught just the same.

The formation of the secondary arcs is no less clearly explained, and is shown to be primarily due to the compression from above

<sup>1</sup> 'Études sur les Echinoïdées,' especially pp. 21 *et seq.*

<sup>2</sup> As in *Cidaris*.

<sup>3</sup> The italics are mine.

downwards to which the test is subjected, and to the widening-out of the composite plates during the process of growth.

I have dwelt at this length on the results of Prof. Lovén's labours, not merely for the purpose of directing again attention to them<sup>1</sup>, but with the more especial aim of showing that it is only on a misconception of the history that one can speak of secondary plates as different from those first formed, or of such being added on to the sides of a primary plate. But the origin of such a misconception is not far to seek; it must surely be due to a study of the arrangement of the pores of the adult, and be comparable to the formulas of Milne-Edwards and Haime as applied to the structure of the coral-septa; while M. Lovén's work will stand no less on an equality with the elegant and instructive researches of Lacaze-Duthiers<sup>2</sup>.

Armed with this knowledge we come now to a consideration of the value of the characters of the arcs of pores. It has been proposed to distinguish the family of the Echinometridæ from the Echinidæ proper on the ground that the former have always more than three pairs of pores to each arc, "while in the Echinidæ the arcs are always composed only of three pairs." "This division, although it appears a numerical one, is yet one of great physiological importance, as the mode of growth of the poriferous zone in these two families is totally unlike"<sup>3</sup>.

I am inclined to think that the accomplished author is here using the term *physiological* in some other sense than that to which its etymology and the current usage of qualified persons justly entitles it; he is too experienced a zoologist to attempt to make the functions of organs do the work of morphological and embryological data. However, the mode of growth of the pores is as much matter for morphologists as for physiologists; and the only question which really arises here is, as to the real character of this total unlikeness. If such exists, it may or may not be of value. But, first of all, does it exist?

Prof. Lovén says<sup>4</sup>:—"Les chiffres par lesquels la disposition des pores est désignée chez cette espèce, les 2, 3, 3, 4, etc. de la série I a . . V b, et les 2, 2, 3, 4, etc. de la série I b . . V a, se retrouvent non seulement dans les espèces voisines, le *Toxopneustes brevispinosus* (Risso) et le *T. lividus* (Lamk.), mais encore dans le *Loxechinus albus* (Mol.), l'*Echinus esculentus*, L., le *Lytechinus variegatus* (Lamk.), le *Tripneustes ventricosus* (Lamk.), la *Boletia heteropora*, Desor, l'*Amblypneustes ovum* (Lamk.), le *Temnopleurus toreumaticus* (Leske), l'*Echinothrix turcarum*, Peters, l'*Echinocidaris punctulata* (Lamk.), en un mot chez tous les Echinides. Les *Echinometra* n'y font pas exception."

So far, then, as the formation of the two separate families Echinometridæ and Echinidæ is based on the difference in the mode of

<sup>1</sup> A short account is to be found in Prof. Huxley's 'Anatomy of Invertebrated Animals' (1877), p. 568.

<sup>2</sup> Archiv de Zool. Exp. vol. i.

<sup>3</sup> Rev. of the Echini, p. 423.

<sup>4</sup> T. c. p. 26.

growth of the pore-plates, the distinction between them altogether breaks down; whether that distinction be physiological or morphological is, then, an unnecessary question.

Coming next to the absolute distinctness of the groups as indicated by the number of the pairs of pores, we are met, first of all, by the considerations which surround the vexed question of the value of any delimitation by the absolute use of definite numbers. On the one hand, it is quite certain that a classification of the Asteroidea which depends on the number of the rays would exhibit a very incomplete account of the systematic relations of the members of the class; but, on the other hand, it is just as true that no better name was ever applied to the winged Insecta than that of Hexapoda, or to the higher Vertebrata than that of pentadactyle; and it is just as clear that the division of modern Ungulates into two groups, one perissodactyle and the other artiodactyle, could only have been suggested by a naturalist capable of seeing a great general truth through a not always constant similarity in detail.

We now have to weigh these two opposing arguments in applying to the Echinidæ (of earlier writers and of Lovén) the mode of classification suggested and worked out by Desor<sup>1</sup>, by which we get the two groups of the Oligopori and Polypori. The test to be applied shall be twofold. First, let us see how it works in the hands of so skilful a naturalist as Prof. Alex. Agassiz. His division of the Echinometradæ is defined (as we already know) as, *inter alia*, always having more than three pairs of pores to each arc. But, as a matter of fact, he includes under the Echinometradæ the two genera *Parasalenia* and *Echinostrephus*. Of the former he says "this genus seems to be an Oligopore among the Echinometradæ, having but three pairs of pores in each arc." In speaking of *Echinostrephus* the generic definition includes no reference to the number of pairs of pores in an arc; but in speaking of *E. molare*, the only species of the genus, he says "there are from three to four pairs of pores in each arc, the majority having but three pairs."

The other consideration arises from a study of the facts as exhibited in the tests of various species. If in any of these some of the arcs can be shown to possess only three pairs of pores, it seems to me that such a fact alone would disqualify numerical relations from forming the criteria of generic, or even higher, delimitations.

Turning again to the guide we have already followed, we find this sentence:—"Le quatrième arc, ici muni de quatre pores, n'en a que trois chez quelques individus du *Toxopneustes drobachiensis*, c'est-à-dire que la plaque composée 3 ne possède qu'une seule plaque primaire médiane. Il y a donc quelque variabilité."

So, again, Dr. Lütken finds in the rare *Echinometra oblonga* that, towards either pole of the corona, there are but two or three pairs of pores in each arc<sup>3</sup>.

<sup>1</sup> Synopsis des Ech. fossiles.

<sup>2</sup> *T. c.* p. 25.

<sup>3</sup> Cf. fig. 10 of the first plate in his 'Bidrag til Kundskab om Echinodermer,' 1864.

And, dealing with the restricted genus *Echinometra*, I have myself been able to make somewhat similar observations in the case of *E. oblonga*, *E. subangularis*, and *E. lucunter*.

If we put into a tabular form the numbers of pairs of pores in an arc, we find the average adult arrangement to present very considerable variation, thus:—

*Echinometra lucunter* has 5 or 4 pairs of pores.

<i>E. oblonga</i>	„	5	„	„
<i>E. viridis</i>	„	5	„	„
<i>E. subangularis</i>	„	6 or 5	„	„
<i>E. macrostoma</i>	„	8, 7, or even 3	pairs of pores.	
<i>E. vanbrunti</i>	„	9, 8, or 7	pairs of pores.	

Having already insisted on the fact that only three pairs of pores are to be detected in the youngest plates, or some of the plates, on the test of certain so-called polyporous species, we will insist as much as possible on the “polypority” of these forms by detailing the arrangements which are found in the best-developed part of the adult test<sup>1</sup>.

(1) <i>Parasalenia gratiosa</i>	....	3	pairs of pores.	
(2) <i>Echinostrephus molare</i>	..	3 (or 4)	„	„
(3) <i>Echinometra lucunter</i>	....	4 or 5	„	„
(4) <i>E. oblonga</i>	.....	4 or 5	„	„
(5) <i>E. subangularis</i>	.....	5 or 6	„	„
(6) <i>Sphærechinus granularis</i>	..	4, 5, or 6	„	„
(7) <i>E. macrostoma</i>	.....	7 or 8	„	„
(8) <i>E. vanbrunti</i>	.....	7, 8, or 9	„	„
(9) <i>Strongylocentrotus bullatus</i>		7 or 8	„	„
(10) <i>S. franciscanus</i>	.....	9	„	„
(11) <i>S. albus</i>	.....	10	„	„
(12) <i>Colobocentrotus atratus</i>	..	12 (ca.)	„	„
(13) <i>Heterocentrotus trigonarius</i>		15 (ca.)	„	„

We come, then, to the following results:—

(1) There is a series of forms which exhibits a gradual increase in the number of primary plates which go to form a secondary plate; but

(2) This series always retains indications of secondary plates in which only one primary plate has ceased to grow with the rest.

When we come to take a general survey of the characters exhibited by the pore-plates, we find the primitive arrangement of the *Cidaris* passing gradually into the complex secondary plates of *Heterocentrotus* and *Colobocentrotus*, which would appear to be the most highly differentiated of the Desmosticha.

<sup>1</sup> Bearing in mind the words of Prof. Gegenbaur (Unters. zur vergl. Anat. d. Wirbelthiere (1864), i. p. 116), “So wichtig es ist für die Aufstellung von Unterschieden der einzelnen Lebensformen und ihrer Einrichtung, die ausgebildeten fertigen Zustände der Organisation zu Unterscheidungsobjecten zu nehmen;” and Flower, Introductory Lecture (1870), p. 37.

It may, at the present juncture, be convenient to recapitulate and extend the results of recent investigations into the characters of the regular Echinoidea.

A classification of the regular Echinoidea is not, as it seems to me, quite so impossible a matter now as it was a few years ago; the discovery, by Mr. Charles Stewart<sup>1</sup>, of the internal gills of *Cidaris*, and the extension and independent confirmation of that result by Dr. Hubert Ludwig<sup>2</sup>, justifies us in accepting the division into *Branchiata* and *Abranchiata*, proposed by the latter naturalist<sup>3</sup>. Although Johannes Müller had distinctly denied the presence of external gills in *Cidaris*<sup>4</sup>, Prof. Alex. Agassiz discovered gill-cuts in the figures of that illustrious anatomist, but only, I fear, by reflecting on the character of the artist, who represents five slits in the median line of the interradian areas; to this, however, Dr. Ludwig has already directed attention.

Readers of the just-mentioned naturalist's essay will remember that he proposes to separate the Echinothuridæ from the rest of the branchiate regular Echinoidea on the ground of the difference in the characters of the buccal plates.

Unfortunately the British-Museum collection contains no specimen of *Asthenosoma*, although an American collection is in possession of a specimen "which the Museum owes to the kindness of Prof. Thomson, collected by the Porcupine Expedition;" and I am therefore unable to give any independent judgment as to the point at issue between Sir W. Thomson and the writer of the just-quoted sentence on the one hand, and Dr. Ludwig on the other. To say nothing of the fact that the Porcupine Expedition was fitted out at the national expense, the present state of the question affords ample evidence of the advantage of rare and typical specimens being deposited in a central and national institution.

Conflicting as the statements are, those of Dr. Ludwig are so explicit, and are made with so distinct a knowledge of the opinions of his predecessors<sup>5</sup>, that I think it is, for the present at any rate, the view to which one ought to incline. The Echinothuridæ, then, though *Branchiata*, are distinguished from the rest by having more than one pair of each series of ambulacral plates carried on to the buccal membrane; they may consequently be distinguished as a *polylepid* as compared with a *decalepid* series.

This *decalepid* series includes the Diadematidæ, the Arbaciadæ, the Echinidæ, and the Echinometridæ, together with the Salenidæ. These last are at once to be separated off from the rest by the characters of their apical area; they are *palæoproctous* forms, as

<sup>1</sup> Trans. Linn. Soc. (2), i. p. 569.

<sup>2</sup> Zeitschrift für wiss. Zool. xxxiv. pp. 70-87.

<sup>3</sup> Prof. Alex. Agassiz gives no information, in his preliminary diagnosis, as to the gills of *Aspidodiadema*.

<sup>4</sup> Abh. Berl. Akad. 1853, p. 146.

<sup>5</sup> He speaks of "ein ganz fundamentaler und bis jetzt nicht beachteter Gegensatz zu den Cidariden." The possession of buccal plates being a characteristic of the Desmosticha, the differences which obtain with regard to them are to be insisted on in the arrangement of the constituent families.



distinguished from the *neoproctous*; and they completely retain the primitive disposition of the primary pore-plates.

In the *neoproctous* group some of the primary plates always lose their primitive relations; but in the *Arbaciadæ* and the *Diadematidæ* this does not always affect the plates above the ambitus, and the poriferous zones are in both almost straight; they are *palæosticha*, as compared with the *Echinidæ* and *Echinometridæ*, which are *neosticha*; and while the *Arbaciadæ* present a *Cidarid* character in the want of connexion between the auricles, the *Diadematidæ* (as represented by *Diadema*) present a curious ancestral character in the possession of rudimentary internal gills (Ludwig).

Coming now to the *Echinometridæ* and the *Echinidæ*, we are at once struck by the fact that it is impossible to find any points of difference between them which are nearly so great, or of such clear systematic value as (1) the presence or absence of external gills, (2) the connexion of the auricles, (3) the presence of a subanal plate, or (4) the number of the perforated buccal plates. Both families are, in other words, branchiate, decalepid, *neoproctous*, *neostichous*.

These relations are exhibited in the following Table:—

*Table of the Groups of the Echinoidea regularia (seu Desmosticha).*

No external gills. Auricular arch not complete and not radial. Ambulacral and interambulacral plates continued on to buccal membrane; pores in straight rows, all the pore-plates primary and subequal. ENTOBRANCHIATA<sup>1</sup>. Fam. 1. *Cidaridæ*.

External gills, auricles radial; interambulacral plates not continued on to the buccal membrane. ECTOBRANCHIATA.

Series  $\alpha$  (Palæoproctous).

Large suranal plate persistent in apical area. Fam. 2. *Salenidæ*.

Series  $\beta$  (Neoproctous).

Anal plates all secondary.

Subseries i. (polylepid).

More than one pair of ambulacral plates carried on to the buccal membrane from each area. Fam. 3. *Echinothuridæ*.

Subseries ii. (decalepid).

Only five pairs of ambulacral plates on the buccal membrane.

A. Auricular arch not complete. Fam. 4. *Arbaciadæ*.

B. Auricular arch complete; rudimentary internal gill still retained (*Diadema*). Fam. 5. *Diadematidæ*.

C. Auricular arch complete; no rudimentary gill.

Fam. 6. *Echinidæ*.

<sup>1</sup> The term *Entobranchiata* appears to me to be preferable to *Abranchiata*; and I consequently use *Ectobranchiata* in place of *Branchiata* (Ludwig).

Turning our attention now to the Echinidæ, we may define them as Regular Echinoidea, with external gills and five pairs of ambulacral plates on the buccal membrane, in which some sets of primary plates always fuse to form a secondary ambulacral plate, in which the auricular arch is complete, and the rudimentary internal gill entirely lost.

If the above be, then, a good and fair definition of the Echinidæ, we come to a consideration of the points by which its constituent genera may become grouped into distinct subfamilies.

The tables already given show that it is hopeless to expect to be able to find any ground of distinction on the absolute number of pairs of pores in an arc; we cannot say that, at any one point, forms with three pairs of pores end and those with four begin. The character, not being a constant or absolute one, is unfitted for use as a *family*-character; nor are there any points which we can propose as affording so wide a distinction between *Echinometra* and *Echinus*. Personal observation can only confirm the general tendency of the researches of Perrier, Stewart, and Mackintosh on the histological characters of the group in question, and lead to acquiescence in the conclusion of M. Perrier:—"On le voit, les modifications qui caractérisent les Echinométriciens sont parfaitement nettes, mais ce ne sont que des modifications dans le type des Echiniens. Le type ne change pas comme lorsqu'on passe du *Cidaris* aux Diadèmes, et de ceux-ci aux *Echinocidaris* ou aux Oursins proprement dits."

These considerations appear to me to be sufficient to justify us in retaining *Echinometra*, *Strongylocentrotus*, *Echinus*, and *Toxopneustes* in one family, and to refuse to follow Dr. Gray or Prof. Agassiz in forming a family Echinometradæ as distinguished from the Echinidæ.

If we look yet a little further we shall find that the elaborateness of the ambulacral plates, the strength of the spines, the size of the buccal apparatus, appear to have culminated in *Heterocentrotus* and *Colobocentrotus* rather than in *Tripneustes* and *Toxopneustes*, which in the latest Revision are, in the systematic list, placed furthest from the Cidaridæ.

Whatever be the significance of the obliquity of the morphological axis, there can be but little doubt that it is of very great importance; and a return to the definition of "body circular," and to the recognition of the differences insisted on by Johannes Müller, seems to be better than a vague union of forms, elevated into a family for no better reason than one that has already (p. 413) been quoted and discussed.

A scheme, therefore, of the following character will probably throw into prominence the points of likeness and unlikeness in the constituent members of the family Echinidæ.

Group I. Body circular . . . . . ECHININÆ.

(a) Secondary plates formed of three  
primary plates . . . . . e. g. *Echinus*.

(β) Secondary plate formed in adult

- of three or more than three primary plates . . . . . e. g. *Strongylocentrotus*.  
 Group II. Morphological axis set obliquely to long axis of the test . . . ECHINOMETRINÆ.  
 Group III. Morphological axis set at right angles to long axis of the test<sup>1</sup> . . . . . HETEROCENTRINÆ.

On the present occasion the observations now to be recorded are based on the classification of the 'Revision;' the further details of altered classification now proposed can only be worked out when sufficient details as to the Triplechinidæ have been presented to the Society; the Temnopleuridæ have already<sup>2</sup> been touched: but even then *Temnechinus* and *Trigonocidaris* must have a place found for them; perhaps that will, after all, turn out to be not among the Echinidæ at all.

I now proceed to the details of some of the genera of the so-called family "Echinometradæ."

#### HETEROCENTROTUS.

If the student lets this paper follow in succession the third part of these "Observations," he will, on examining the subjoined percentage values, be struck by the fact that there is not by any means that marked diminution in the proportional values of the actinal and abactinal systems to which attention could scarcely fail to have been drawn in the study of the Temnopleuridæ. The character of these latter, though perhaps hardly so well marked, will be seen when the species of the genus *Echinometra* come under inspection.

I have not been able to detect any very striking differences in the characters of the buccal apparatus of *H. mammillatus* and *H. trigonarius*. The most important is, probably, their difference in size; for while a test of *H. mammillatus*, with a height of 26 millim., gave as a measurement from the tip of the tooth to the top of the epiphysis the almost paradoxical amount of 29 millim., two tests of *H. trigonarius*, 21 and 25 millim. high respectively, gave for the same distance 21 and 23 millim. in the two cases.

In both cases there are ascending and descending processes, which are perhaps a little better developed in *H. mammillatus*, as is also the hammer-headed widening of the free end of the radius, and its division by a median notch.

<sup>1</sup> It is not yet time to forget the words of J. Müller:—"Der Körper nur bei querer Lage symmetrisch, welcher von der erstgenannten Gattung (*Echinometra*) bereits von Brandt erkannt, und durch *Corpus transversum* ausgedrückt, von Agassiz aber nicht bemerkt worden, der diese Formen mit *Echinometra* für schief angesehen hat" (Abh. Berl. Akad. Wiss. 1853, p. 128).

<sup>2</sup> P. Z. S. 1880.

## HETEROCENTROTUS MAMMILLATUS.

Greatest diam., in millim.	Morphol. axis, in millim.	Percentage value <sup>1</sup> of				
		Height.	Actinostomo.		Abactinal area.	Anal area.
			Long axis.	Morph. axis.		
44	37	56.7	56.7	55.4	24.3	10.8
45	36	55.5	63.8	61.1	27.7	11.1
59	53	58.4	50	49	18.8	8.4
65	58	63.7	49.1	53.4	19	9.5
75	66	59.9	59.9	56.6	22.7	9.9

## HETEROCENTROTUS TRIGONARIUS.

Longest diam.	Morphol. axis.	Percentage value of				
		Height.	Actinostome.		Abactinal area.	Anal area.
			Long axis.	Morph. axis.		
45	36	58.3	61.1	59.7	20.8	9.7
60	50	60	55	55	20	10
73	66	56	50.7	51.5	18.9	9
93	78	56.4	51.9	50.6	21.1	10
113	91	54.9	..	...	19.7	8.7

As compared with *H. mammillatus*, we may note the striking equality of the lengths of the true and of the apparent long axes of the actinostome in this species.

## COLOBOCENTROTUS.

The proportional measurements of the two species of this genus exhibit the greatest variability; and here, as in the case of *Heterocentrotus*, there is no marked diminution in the proportional value of the diameters of the actinal and abactinal series as the test increases in size.

This striking deviation from the ordinary rule does not show itself when the genus *Echinometra* proper comes to be studied; and it is impossible to resist the suspicion that the "obliquity" of the long axes of *Heterocentrotus* and *Colobocentrotus* on the one hand, and *Echinometra* on the other, is not altogether to be referred to the same cause.

<sup>1</sup> The percentage values are, of course, calculated from the morphological axis.

COLOBOCENTROTUS ATRATUS<sup>1</sup>.

Longest diam.	Morphol. diam.	Percentage value of				
		Height.	Actinostome.		Abactinal area.	Anal area.
			Long.	Morphol.		
42	39	40	42.3	42.3	18	7.9
53	47	53.1	51	48.9	21.2	8.5
67.5	61	50	43.4	41.8	22.1	8

## COLOBOCENTROTUS MERTENSI.

Greatest length.	Morphol. axis.	Percentage value of				
		Height.	Actinostome.		Abactinal area.	Anal area.
			Long.	Morphol.		
49	44	35.2	44.3	45.4	23.6	8.1
50	43.5	42.5	48.5	48.5	25.5	10.3
55	48	38.5	39	37.2	20.8	7.7

## ECHINOMETRA.

The characters of the different parts of the buccal apparatus seem here, as in so many other genera of regular Echinoidea, to present just those slight differences in detail which are so important an aid in the accurate discrimination of species.

The *alveolar foramen*, never large, is larger in *E. vanbrunti* and *E. viridis* (where it is nearly half as long as the whole alveolus), than it is in *E. lucunter* or *E. subangularis* (where it is very distinctly less than half the length); it is smallest in *E. lucunter*.

The *radius* is simplest in *E. lucunter*, widening only very gradually and very slowly, and not having its free end notched; in *E. vanbrunti* it is a little longer, distinctly wider, but only faintly notched. In *E. viridis* and *E. subangularis* the free end is wider; and in *E. subangularis* it is hammer-shaped, owing to its somewhat sudden widening out at its free end; but there is only a feebly developed notch. In *E. viridis* the notch is more distinct than in any of the three just mentioned species.

When the observer looks straight through the alveolar foramen, holding the tooth vertically, a delicate ascending and descending process on either side is to be observed in *E. vanbrunti*; in *E. lucunter* the ascending process can just be detected; in *E. subangularis* neither process can be seen; while in *E. viridis* it is the descending, instead of the ascending, process which is visible.

<sup>1</sup> This species would seem to be figured in the Phil. Trans. vol. xlix. (1755), pl. viii. fig. 3.

## ECHINOMETRA LUCUNTER (Lamk.).

Questions of identifications of species are in some cases interminable; and we seem here to have an example of one in which there would be found much to say on both sides, were it worth the while, and were questions of synonymy the end of zoological science. I shall not, I imagine, be accused of any blind following of Prof. Alex. Agassiz; but I follow him in this case for what, I submit, is a sufficient reason. The labels of Linnæus's specimen of *E. lucunter* are lost; Leske found it difficult to decide to what figure of Klein's Linnæus meant to refer: Lamarck's typical specimens are in existence. The reviser of the group having to settle what species he would call *E. lucunter*, came to the conclusion that he would follow Lamarck. Whether the present writer would have done the same, had he been the reviser, need not be discussed; it is certain that had Prof. Lovén or Dr. Lütken been the revisers, they would have adopted a different course (*cf.* Agassiz, *op. cit.* p. 284). But a decision has been given: it is almost certain that no further light will ever be thrown on the difficulty; the 'Revision of the Echini' is our present standard. Let us, then, when we cannot oppose facts to facts, but only opinions to opinions, follow the Reviser, and let the question (and all such questions) drop.

Large forms of this species differ so much in appearance from smaller specimens, that, where the series fails, one is at once almost inclined to imagine that one has to do with a distinct species. One specimen in the national collection (which has its longest axis 79 and its morphological axis 76 millim. long) is greatly bowed on its actinal surface, and has the smaller tubercles exceedingly well developed; there is a large number of very small anal plates; here and there five pairs of pores are found in an arc. But the most striking variation, and one which, in our present state of information, we should almost be justified in taking as a basis for the formation of a distinct variety, represented by this form, lies in the characters of the auricular arch: there is a considerable development in the amount of calcareous matter there laid down; the arch is consequently very strong, the foramen very small, the top piece is well developed, and the connecting ridge, instead of being low, is nearly half the height of the whole arch.

The plates on the buccal membrane are very large; and the ends of the radii in the lantern of Aristotle are well developed.

On the other hand, the characters of the auricular arch are not very constant in this species; and the proportions of the parts of the specimen in question are not at all unlike those of a specimen 76 millim. in diameter, the measurements of which are given in the 'Revision of the Echini,' so that better service is done by directing attention to its peculiarities than by imposing a new name on this already heavily weighted species.

Two specimens, purchased in 1844 from Mr. Gould, bear the locality of "Abrolhos." I am unable to distinguish them from other specimens of *E. lucunter*; and I can hardly suggest that the locality given in the Register is altogether wrong; for one specimen, at any

rate, of those purchased at that time from Mr. Gould is a representative of *E. subangularis*<sup>1</sup>.

#### ECHINOMETRA LUCUNTER.

Longest axis, in millim.	Morphol. axis, in millim.	Percentage value of			
		Height.	Actino-stome.	Abactinal area.	Anal area.
19	18	44.4	50	25	11.1
29.5	27	49.2	46.2	23.9	11.1
...	31	41.9	40.3	22.5	11.25
53	51.5	58.2	43.1	19.4	10.9
54	53	49	43.3	18.5	9.25
59	55	58.1	42.7	21.8	10
65	63	59.5	38.8	17.6	10.3

The use of the percentage method in detecting variations, and the extent of the variations themselves, seem to be well shown in this Table.

#### ECHINOMETRA SUBANGULARIS.

Longest diameter, in millim.	Morphol. axis, in millim.	Percentage value of			
		Height.	Actino-stome.	Abactinal area.	Anal area.
14	13.25	45.2	52.6	26.7	9.5
31	30	46.5	46.5	20	10
46.2	45	.....	45.5	16.6	...
55	53.5	53.2	44.7	15.8	7.4
60	58	54.3	40	17.2	8.6

It may be well to direct attention to the fact that the longest axis is very little longer than the morphological axis, another point in which *Echinometra* contrasts very strongly with the two genera which here precede it.

#### ECHINOMETRA VANBRUNTI.

Long axis, in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal area.	Anal area.
28	39.2	46.4	19.6	10.7
57	49.8	38.6	...	...
57.5	51.3	36.5	16.5	9.5

<sup>1</sup> In a conversation with Mr. Howard Saunders I was reminded that there is a Houtman's Abrolhos on the western coast of Australia; and I have now no doubt that the registrar of the specimens in the year 1844 did not sufficiently distinguish between the two localities.

## ECHINOMETRA MACROSTOMA.

The single spineless test which, as it seems, should be referred to this species, gives the following measurements:—

Greatest length, in millim.	Morphol. axis, in millim.	Percentage value of			
		Height.	Actino-stome.	Abactinal area.	Anal area.
45	43.5	50.5	43.9	20.6	11.2

It will be of great interest to examine the buccal apparatus of this rare species.

The specimen in the Museum collection bears no indication of its locality; we know, however, that Dr. Lütken is satisfied as to certain specimens, at any rate, having come from Guinea<sup>1</sup>.

## ECHINOMETRA VIRIDIS.

Absol. diam., in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal area.	Anal area.
(?) 11.5	34.7	52.1	45.2	11.3
13	40.3	48	20	11.6
15	36.6	50	20	11.6

## STOMOPNEUSTES.

This is an exceedingly difficult genus, and one with regard to which we must have much more information than we possess at present before we can speak at all definitely as to its real affinities. Whatever be the meaning of the "eccentricity" of its test, I must confess that I see no reason, at present, for regarding it as morphologically comparable with that of *Echinometra*; for the "tendency to obliquity" is only found in the axis of *old* specimens, whereas in *Echinometra* we are informed that the obliquity is "an embryonic feature." We shall do better to wait for more accurate information than to spend our time in reconciling statements which sufficiently well contradict themselves.

I give the figures following for what they are worth; they prove that great variations obtain in the only species of the genus now known to us.

<sup>1</sup> Cf. Zool. Record for the year 1873.



## STOMOPNEUSTES VARIOLARIS.

Absol. diam., in millim.	Percentage value of			
	Height.	Actino- stome.	Abactinal area.	Anal area.
59	52.5	27.1	16.1	8.1
60	50	31.6	16.6	...
69	52.1	28	17.3	8.6
73	53.4	26.6	20	10.9

## STRONGYLOCENTROTUS.

In adopting the generic name of *Strongylocentrotus*, proposed in the year 1835 by Brandt, Prof. Alex. Agassiz has done no more than justice to that eminent naturalist; but this act of justice is accompanied by the considerable reward that it has enabled him to group under one name, for all practical purposes new<sup>1</sup>, the varied forms which had been distributed among different generic sections under the names, chiefly, of *Euryechinus*, *Heliocidaris*, *Toxocidaris*, and *Loxechinus*.

It is the group which at present contains a larger number of species than any other Echinid genus: fourteen species are recognized in the 'Revision;' to this number I have myself been obliged to add one for the reception of certain specimens from the Straits of Magellan<sup>2</sup>; so far as I know, no other zoologist has obtained any representative of a new species.

## STRONGYLOCENTROTUS ALBUS.

Absolute diameter, in millim.	Percentage value of			
	Height.	Actino- stome.	Abactinal system.	Anal area.
54	51.8	27.4	20.3	11.1
75	45.3	24	18	10.6
114	43.8	21.9	14	...
115	47.8	20.9	15.7	9.5

<sup>1</sup> The recognition of the name (*Strongylocentrus*) by Dr. Gray (1855) was, unfortunately, ignored by subsequent writers, and seems even to have escaped Mr. Agassiz. Cf. *op. cit.* p. 161.

<sup>2</sup> P. Z. S. 1881, p. 88.

## STRONGYLOCENTROTUS ARMIGER.

Absolute diameter, in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal system.	Anal area.
26	48	34.6	19.2	10.5
32	46.8	32.8	18.7	10.0
47	46.8	31.9	19.1	8.9
69	40.5	28.9	15.9	7.2
76	46	30.2	16.1	7.2

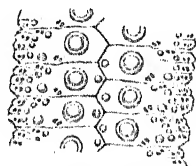
## STRONGYLOCENTROTUS BULLATUS.

Absolute diameter, in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal area.	Anal area.
38	50	31.6	23.7	12.1
94	...	30.8	18	10.6
115	45.2	23.04	18.2	9.5

## STRONGYLOCENTROTUS DEPRESSUS.

A dry test, denuded of spines, is very probably to be referred to this species; I proceed, however, to point out a number of characters by which it appears to differ from the descriptions of *S. depressus* as given by Prof. Alex. Agassiz, or the *E. disjunctus* of Prof.

Fig. 1.



Ambulacral area of *S. depressus*, to show the disposition of the pairs of pores.

von Martens. The test is not so depressed; the primary tubercles are not so numerous; the poriferous zone is not specially broad; and it is not the uppermost, but the lowermost pair of pores that is "disjunctum." As to this last point, however, there is possibly some error of observation, as it is difficult to see the exact position of the pair of pores in question, since they lie altogether at the edge of the plate. If the difference is real, it is probably one of specific importance. Prof. Agassiz remarks that in specimens with a depressed test, "the inner and one outer pairs of pores" are disconnected.

I give a short technical account of the test in question, together with the more important measurements.

Test somewhat depressed; apical system large; genital pores large; two large oculars touch the periproct; pairs of pores five in an arc; in one or two cases there are six; the lowermost pair is separated from and is internal to the rest, so that it forms a well-marked inner line. On each series of the plates of the corona there is a row of large primary tubercles, which rapidly diminish in size from the ambitus to the actinostome; at the ambitus the interambulacral tubercles have a smaller primary on either side; the outermost of these rows reaches to the actinostome, and extends also a short way up the side of the test; the inner row extends higher up the side of the test, but soon becomes lost on the actinal surface; the ambulacral plates are well provided with secondary and miliary tubercles on the actinal surface, but very slightly so on the abactinal. Actinostome moderate, actinal cuts slight, auricles rather delicate, foramen well marked, connecting ridge slight. General colour of the test yellowish green; the tubercles white. Spines? Hab.?

The following are the more important measurements.

Diameter.	Height.	Actinostome.	Abactinal area.	Anal area.
42	19	15·5	10	4
	[45·2] <sup>1</sup>	[37·8]	[23·8]	[9·5]

#### STRONGYLOCENTROTUS DROBACHIENSIS.

Absolute diameter, in millim.	Percentage value of			
	Height.	Actinostome.	Abactinal area.	Anal area.
11	63·63	45·45	...	18·18
12	50	43·7	...	22·7
19	50	47	26·3	13·15
24	45·8	41·6	27·08	14·5
30	43·3	41·6	30	15
35	42·8	38·5	25·7	15
39	51·2	38·4	25·6	12·8
53 <sup>2</sup>	56·6	35·8	22·6	13·2
(?) 65	58·4	30·7	18·4	10·7

Some of the fluctuations in percentage values shown by the above table give an idea of the variations exhibited by this widely spread and circumpolar species. The author of the 'Revision of the Echini' rendered considerable service to the students of this and allied species, when he pointed out that under the name of *S. drobachiensis* it was necessary to include so many that are merely nominal.

Mr. Leigh Smith has presented to the British Museum specimens of this species which he dredged in the seas off Franz-Joseph Land, as well as others taken to the north of Spitzbergen; Messrs. Hart

<sup>1</sup> Percentage value.

<sup>2</sup> "*E. neglectus*."

and Feilden collected them at Franklin-Pierce Bay, Cape Napoleon, and Hayes Point, during the Arctic Expedition of 1875-76; Capt. Markham found specimens at 73° 10' lat., 53° long.; the officers of the 'Valorous' Expedition collected specimens off Greenland. Other examples have lately been received from the United States Fishery Commission, which collected them at Eastport, Maine.

**STRONGYLOCENTROTUS ERYTHROGRAMMUS.**

Absolute diameter, in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal system.	Anal area.
27.5	47.2	30.9	18.1	9.05
35	40	...	20	8.5
57	47.3	31.5	19.3	9.2
57	45.6	30.7	19.3	10.9 <sup>1</sup>
100	48	29	13	7.5

**STRONGYLOCENTROTUS FRANCISCANUS.**

Absolute diameter, in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal area.	Anal area.
90	55.5	25.5	23.7	...
110	46.46	30.9	18.1	10

**STRONGYLOCENTROTUS GIBBOSUS.**

This species, obviously, does not lend itself to proportional measurements.

**STRONGYLOCENTROTUS LIVIDUS.**

Absolute diameter, in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal area.	Anal area.
24.5	50	36.7	22.8	12
34	47	32.3	20.5	8.7
38	47.3	31.5	19.2	9.8
60	55.5	29.1	18.3	10
63	49.2	30.1	16.6	...

<sup>1</sup> Madreporic plate considerably swollen.

**STRONGYLOCENTROTUS PURPURATUS.**

Absolute diameter, in millim.	Percentage value of			
	Height.	Actinostome.	Abactinal area.	Anal area.
50	44	34	18	10
53	52.8	32	17.4	8.9
55	44.1	30.9	18.1	9

**STRONGYLOCENTROTUS TUBERCULATUS.**

Absolute diameter, in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal area.	Anal area.
26	46.1	34.6	19.2	9.6
31.5	44.4	33.3	19	10.3
43	50	32.5	20.9	10.4
54	46.3	27.7	16.6	7.4
60	48.3	31.6	15.8	6.6

Owing to the fact that the number of species in this genus is, among the Echinoidea, so large, I have added to the Tables just given others, which show certain points in the characters of the different species which are undoubtedly of specific value.

I have for these points examined every species which is represented in the national collection; and I have to express my hope that other observers will fill in the lacunæ in our knowledge of the points now to be discussed.

#### *Relations of the Ocular Plates to the Anal Area.*

- (a) All shut out. . . . . i. *bullatus*.  
 ii. *lividus*  
 (and, as we may suppose, *guimardi*).  
 iii. *depressus*.  
 (β) Two touch . . . . . iv. *armiger*.  
 v. *drobachiensis*.  
 vi. *erythrogrammus*.  
 vii. *franciscanus*.  
 viii. *intermedius*.  
 ix. *purpuratus*.  
 x. *tuberculatus*.  
 (γ) Three touch . . . . . xi. *gibbosus*.  
 (δ) Four touch. . . . . xii. *albus*<sup>1</sup>.

<sup>1</sup> This is true of full-grown specimens. In the younger all the oculars may be shut off; but it is possible that four of these have even then a different position to the fifth, or one lying to the right of the madreporic plate.

I am unable to give any information as to the oculars of *S. mericanus* or *S. nudus*: no mention is made of this character in the diagnoses given in the 'Revision'; nor are they there figured. Neither species is represented in the British Museum.

With regard to the characters of the *radius*, the number of species on which I have any thing to report is, unfortunately, still smaller; the buccal apparatus of *S. franciscanus*, *S. gibbosus*, and *S. depressus* being wanting from the British-Museum specimens.

*S. tuberculatus* would appear to be distinguished by the fact that the radius is not notched terminally, while in *albus*, *armiger*, *erythrogrammus*, *intermedius*, and *purpuratus* it is always so notched; *S. bullatus* rather has the free end of the radius deeply *grooved* than notched.

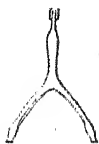
*Characters of ascending and descending Tooth-processes.*

- |  |                            |
|--|----------------------------|
| (α) Both present . . . . .                 | i. <i>erythrogrammus</i> . |
| (β) Ascending process evanescent . . . . . | ii. <i>armiger</i> .       |
| (γ) Ascending process absent . . . . .     | iii. <i>albus</i> .        |
|  | iv. <i>bullatus</i> .      |
|  | v. <i>drobachiensis</i> .  |
|  | vi. <i>intermedius</i> .   |
|  | vii. <i>lividus</i> .      |
|  | viii. <i>purpuratus</i> .  |
|  | ix. <i>tuberculatus</i> .  |

SPHÆRECHINUS.

The difficulties which are offered by the great development of the tubercles and the special characters of the gill-cuts in species of this

Fig. 2.



Radius of *S. granularis*, seen from in front.

genus have always appeared to me to stand in the way of the view taken by Prof. A. Agassiz, which regards this genus as a subgenus of *Strongylocentrotus*. An examination of the buccal apparatus seems to me to do more than justify this hesitation. The free end of the radius, in place of being merely widened out at its end, presents a strong and deep furcation, each leg of the fork measuring 6 millim., in a radius of which the azgyos piece was 11 millim. long, and the angle so wide as to separate the free ends of the legs by 5 millim. It has not been my fortune to meet with so aberrant an arrangement in any other regular Echinid save *Toxopneustes*.

## SPHERECHINUS GRANULARIS.

Absolute diameter, in millim.	Percentage value of			
	Height.	Actinostome.	Abactinal area.	Anal area.
i. .49 <sup>1</sup>	61.2	36.7	18.35	10
ii. 50 <sup>1</sup>	62	36	18	10
iii. 57 <sup>1</sup>	63.1	35	15.8	8.3
iv. 64 <sup>1</sup>	56.2	32.8	19.2	11.7
v. 70 <sup>1</sup>	68.5	29.2	17.1	9.3
vi. 78 <sup>1</sup>	64.1	29.5	19.2	10.9
vii. 85 <sup>1</sup>	54.1	29.4	15.3	7
viii. 36	72.2	36	16.6	8.3
ix. 75	56	33.3	16	8.6
x. 102	66.1	28.4	15.6	8.3

The first seven specimens, coming all from one locality, are very interesting, as exhibiting the range and character of the variations in this eminently variable genus.

## PSEUDOBOLETIA.

This genus has been so amply defined by Prof. Troschel, that it is only necessary to put his definition into English. "Test flattened and curved, thin; tubercles small; four pairs of pores in an arc; two ocular plates touch the periproct; rather deep gill-fissures; auricles with large foramen and low connecting ridge. It is distinguished from *Boletia*, Desor, by having four pairs of pores in each arc."<sup>2</sup>

Two species have been described in it—one by Michelin as *indiana*, the other by A. Agassiz as *Boletia granulata*. By the latter author *Pseudoboletia* is recognized as a subgenus, and *P. stenostoma* and *P. maculata* of Troschel are stated to be synonymous with *P. granulata* and *P. indiana* respectively.

There are certainly two species in the British-Museum collection; and one is just as certainly *P. indiana*; the other species is certainly *stenostomatous* as compared with *P. indiana*, and even more so than was Prof. Troschel's specimen; this, of course, may be due to the fact of its being older. When we study it by the aid of the original definition<sup>3</sup> of *B. granulata*—"remarkable for its comparatively long spines; tubercles uniform in size, very closely crowded together,"—we are unable to gain any assistance from the first clause, owing to the absence of the spines; but the second half of the definition applies very well; and, on the whole, I am inclined to feel certain that the specimens are representatives of *P. granulata*. If, however, they are so, they give a somewhat different aspect to the

<sup>1</sup> These specimens were collected at Naples.

<sup>2</sup> Sitzb. naturh. Ver. preuss. Rheinl. 1859, p. 96.

<sup>3</sup> Bull. M. C. Z. i. 2 (1863), p. 24.

geographical distribution of the species than it has had hitherto; for the two specimens are both reported to have come from the island of Mauritius, whence the other species (*P. indiana*) has (as it seems) been already obtained; and the only locality for *P. granulata* hitherto recorded is that of the Sandwich Islands. *P. indiana* has been received from

- (a) Masbate,
- (b) Philippine Islands,
- (c) Zamboanga (coll. Challenger),
- (d) Port Lincoln, Torres Straits.

I do not find myself able to agree with the view according to which we should regard *Pseudoboletia* as standing in subgeneric dependence to *Strongylocentrotus*. It seems to me that, as defined by Prof. Troschel, it has the most distinct characters; the constant possession of four pairs of pores, the deep gill-fissures and large gills, the constant abutting of two ocular plates on the anal region, the very considerable size of the lantern of Aristotle, are certainly enough characters which can hardly be subordinated to the form in which variability in the number of pores is found even in individual specimens, in which the gill-cuts are always slight, in which no ocular plate, or only one, may touch the anal area, and in which the buccal apparatus does not attain to any specially large size.

But I need hardly attack this "man of straw;" for although Prof. Alex. Agassiz does technically regard it as a subgenus, yet he (p. 455) speaks of it as a genus, and regards it as intermediate between the Echinometradæ and the Echinidæ.

The size of the buccal apparatus is very remarkable: in two specimens of *P. indiana*, which had the test respectively 32 and 25 millim. high, the height of the lantern of Aristotle was 26 and 22 millim. respectively. If similar results should be obtained with *P. granulata*, it will be necessary to introduce the character into the diagnosis of the genus, and to examine into the extent of its affinity to *Heterocentrotus*.

#### PSUEDOBOLETIA GRANULATA.

Absolute diameter, in millim.	Percentage value of			
	Height.	Actinostome.	Abactinal area.	Anal area.
80	43·7	36·2	15·6	6·8



## PSEUDOBOLETIA INDIANA.

Absolute diameter, in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal area.	Anal area.
70	45.7	42.1	16.4	7.1
53	47.1	42.4	15	...
52	49.4	40	12.3	...

## ECHINOSTREPHUS.

For the present it is not possible to do more than give the accompanying table of measurements; when any change is made in the position of this curious genus, it should be based on a fuller knowledge of its life-history than we at present possess. In the meantime, in its unusual form it stands alone, not only among the Echinometridæ, but among all the Echinidæ. The smallest specimen measured (which is also smaller than any measured by Prof. Alex. Agassiz) would seem to show that there is, during the rather earlier stages, a considerable diminution in the proportional values of the abactinal and actinal areas.

## ECHINOSTREPHUS MOLARE.

Absolute diameter, in millim.	Percentage value of			
	Height.	Actino-stome.	Abactinal area.	Anal area.
14.5	48.2	44.8	27.5	13.5
25	54	38	23	10
26.5	49	32	22.6	...

2. Description of a New Species of the Genus *Mespilia*.

By F. JEFFREY BELL, M.A., F.Z.S.

[Received February 24, 1881.]

When, last year, I was engaged in naming and revising the specimens of Temnopleuridæ in the British Museum, I was unable to satisfy myself as to the exact specific nature of the specimen now to be described, and which I propose to name after its discoverer.

## MESPILIA WHITMEI, n. sp.

The examination of this species revives nearly all the difficulties as to the definition of the genera *Mespilia* and *Amblypneustes*. The

special point which characterizes this new species will perhaps bring into prominence the whole question of the real affinities of these forms: it is the well-marked character of the gill-cuts of the actinostome, which, in the only species of the genus known hitherto, are so very feebly developed.

The specimen on which the following description is based was presented by the Rev. S. J. Whitmee, and is stated to have come from the Samoa Islands. It is in the dry condition. The test, from above, is obscurely pentagonal in form, and not at all high; the spines are delicate, yellowish or greenish yellow in ground-colour, and banded or tipped with red; they are richly developed over the whole surface of the test, with the exception of the middle portion of the interambulacral area. In correspondence with this there is, of course, a portion of the interambulacral plates devoid of primary tubercles; but this is only seen above the ambitus; this bare band is much narrower than in *M. globulus*. At the ambitus there are four large primary tubercles in a row on either side of the middle line; the space on either side of these is occupied by smaller tubercles, which are not quite so regularly arranged; as we pass nearer the actinostome, first these latter tubercles and then the outer primary tubercles disappear; those that remain retain or even exceed the size of those at the ambitus.

In the ambulacral area a row of four tubercles on either side can likewise be made out at the ambitus. In having the same number of primary tubercles in the interambulacral as in the ambulacral area this species differs from *M. globulus*, which, however, it resembles in having the largest and most conspicuous of the interambulacral tubercles nearest to the poriferous zone. There is but a very feebly developed, bare, intraambulacral space; but the sutural pores between the plates are more conspicuous in the ambulacral than in the interambulacral area.

The gill-cuts are well marked and wide. The auricular foramen is large, much larger than in *M. globulus*, and quite as large as, if not larger than, that of *Amblypneustes pallidus*. The connecting ridge is low, and, at its middle point, is produced into a short, pointed, upwardly-directed process; the actinostome is moderately large.

The abactinal area is by no means small; all the oculars remain shut out from the edge of the anal area; and in no essential point does it differ in character from that of *M. globulus*; there is a rich supply of tubercles; and the peripheral anal plates are large and tuberculated. The poriferous zone is not so wide as in *M. globulus*; but the pairs of pores are still arranged in two vertical rows, and the number of those in the outer seems to be about double those in the inner row.

The foramen of the pyramid is perhaps a little larger than in *M. globulus*; as in it, the radius is not bifid at its free end; but its spatulate character is very much more developed.

The general ground-colour of the test is greyish brown; the tubercles are yellowish or whitish.

This new species is at once to be distinguished from *M. globulus* by (1) its well-marked gill-cuts, (2) the extreme narrowness of the median bare space and the consequent increase in the number of the tubercles, (3) the more spatulate character of the free end of the radius.

When its proportional measurements are compared with the specimen of an absolute diameter of 36 millim.,<sup>1</sup> we find the new species to be not so high, and to have the actinal, abactinal, and anal areas all proportionally a little larger.

Diam.	Height.	Abactinal area.	Anal area.	Actino- stome.
38	22	7.25	3.5	12
	[57.9]	[19]	[9.2]	[31.5]

The numbers in brackets are the percentage values.

### 3. Contributions to the Anatomy of Passerine Birds.—Part IV.<sup>2</sup> On some Points in the Anatomy of the Genus *Conopophaga*, and its Systematic Position. By W. A. FORBES, B.A., Prosector to the Society.

[Received February 28, 1881.]

As regards the true relationships of the genus *Conopophaga* considerable doubt has hitherto prevailed amongst systematic zoologists. By Sundevall<sup>3</sup> it was placed amongst the Tyrannidæ, on account of its depressed beak and the nature of its tarsal scutellation. Messrs. Selater and Salvin, in their valuable 'Nomenclator Avium Neotropicalium'<sup>4</sup>, followed Sundevall—the Conopophaginæ, consisting of the genera *Conopophaga* and *Corythopsis*, therein forming the first subfamily of the Oligomyodian Tyrannidæ. All these authors, however, had overlooked the fact that Johannes Müller, in his classical memoir on the Voice-organs of the Passerina<sup>5</sup>, had described the syrinx of *Conopophaga aurita*, and had found it to be completely tracheophone, that of the Tyrannidæ having, of course, no such structure. Garrod was, no doubt, aware of Müller's results; for in his proposed rearrangement of the Tracheophone Passeres<sup>6</sup>, he made the "Conopophagidæ" a distinct family, which he placed between the Dendrocolaptidæ and the Formicariidæ. No reasons, however, for the change were there given.

A few days ago Mr. Salvin called my attention to the fact that in a skeleton of *Conopophaga melanops*, lately acquired for the Cambridge

<sup>1</sup> P. Z. S. 1880, p. 435.

<sup>2</sup> For Part. III. see P. Z. S. 1880, p. 387.

<sup>3</sup> Tentamen, p. 60: Stockholm, 1872.

<sup>4</sup> L. c. p. 41: London, 1873.

<sup>5</sup> Ueber d. Stimmorgane &c., p. 39: Berlin, 1847. Garrod's edition, p. 32.

<sup>6</sup> P. Z. S. 1877, p. 452.

University Museum, the sternum presented *four* notches along its posterior margin, a very unusual condition in Passerine birds. This again drew my attention to the genus; and being fortunately the possessor of a specimen in spirit of *Conopophaga lineata* from Pernambuco, I have been enabled to confirm Mr. Salvin's discovery, as well as to make some other notes on the structure of this genus. As regards the sternum, it will be seen, from the drawing I now exhibit of that of *Conopophaga lineata*, to possess, as already stated, four



Sternum of *Conopophaga lineata*, of the natural size; viewed, slightly obliquely, from the side.

notches, two on each side, on its posterior margin. Both are quite distinct; but the outer one is considerably the larger of the two, running up to near the base of the "costal process." The outer xiphoid process diverges considerably, so that there is a wide space between its termination and that of the internal one. This latter is terminally expanded and closely approximated, internally, to the body of the sternum, with only a very narrow cleft separating the ossified parts there. In other respects the sternum and its appendages are characteristically Passerine, there being a large bifurcated manubrium sterni, and a long, forwardly directed, costal process. The clavicles are well developed, with a large *hypocleidium* and strongly expanded scapular ends. The *carina sterni* is well developed. The only other Passerine birds in which the sternum is four-notched are, so far as is yet known, sundry species of Pteroptochidæ (*Pteroptochus albicollis*, the species of *Hylactes*, and *Scytalopus indigoticus*). In *Pteroptochus albicollis* the two notches of each side are more nearly equal in size, and the internal xiphoid process is separated by a considerable interval from the body of the bone.

As regards the skull, *Conopophaga* is typically Passerine, not being in the slightest degree schizorhinal, as already stated by Garrod (*l. c.*). The vomer is broad and bifurcated. The maxillo-palatine processes are fairly long, spongy at the base, and recurved and dilated slightly apically, and do not articulate with the vomer, as is the case (*e. g.*) in *Thamnophilus*<sup>1</sup>. The "transpalatine" processes are well developed. In the macerated skull the external nares are divided into an anterior and a posterior opening, by the ossification of the alinasal cartilages. The same is the case in the species of *Thamnophilus* and in many other Passeres. I do not, however, attach much systematic importance to this character, as it occurs in *Cymbirhynchus*, and not

<sup>1</sup> Cf. Parker, Trans. Zool. Soc. ix. p. 313, pl. lvii. fig. 9.

in *Calyptomena*, and in *Hadrostomus*, *Tityra* (just), and *Lipaugus*, but in none other of the Pipro-Cotingidæ. The only Tyrannine bird in which I have observed it is *Arundinicola leucocephala*.

From the character of its skull nothing very definite can be predicated of *Conopophaga*, except that it clearly has no relation to Furnariine forms. In its visceral anatomy, myology, pterylosis, and other characters I have detected no deviation from the ordinary Passerine structure. The typical arrangement of the *tensor patagii brevis* tendon is somewhat concealed, as in *Pteroptochus* and *Hylactes* (cf. Garrod, P. Z. S. 1876, p. 510), by the muscular fibres at the origin of the *extensor metacarpi* muscle. There is no trace of a *vinculum* in the deep flexor tendons of the foot. The artery of the leg is the sciatic. In the tarsi the anterior scutes, about six in number, extend round to the posterior margin exteriorly, leaving the internal plantar space covered by a smooth skin, with no signs of scutes or scutellæ. In its possession of an "exaspidæan"<sup>1</sup> tarsus, *Conopophaga* differs from all other forms of Tracheophonæ, and resembles *Oxyrhynchus*, the Tyrannidæ, and Pipridæ alone of Passerine birds.

The *Tracheophone* syrinx of *Conopophaga aurita* has been briefly described and figured by Müller<sup>2</sup>; and from that species *C. lineata* does not essentially differ. I find, however, that in this latter species the commencement of the tracheal syrinx is less abrupt than is depicted by Müller, the few preceding tracheal rings, particularly posteriorly, becoming gradually less and less deep as they approach the membranous part. The last tracheal ring is deeper and stronger than its predecessors, and is incomplete in the middle line behind. The first bronchial semiring is considerably stronger than the second one, and bears the *processus vocalis*, which extends upwards for about two rings. The last tracheal and first two bronchial semirings are less closely connected together than in Müller's figure. The tracheal syrinx forms a somewhat dilated *tympanum*. As regards the muscles, my observations agree with Müller's as to there being no intrinsic muscles, as the lateral tracheal muscle stops at the commencement of the membranous part of the trachea, from which place also the *sterno-tracheales* diverge.

This syrinx of *Conopophaga* does not exactly agree with that of any other Tracheophone group. In that it possesses *processus vocales* it resembles that of the Furnariidæ and Dendrocolaptidæ described by Müller (*Pteroptochus*, *Hylactes*, *Formicarius*, and *Grallaria*), and differs from *Thamnophilus* and *Hypocnemis*. In the absence of any intrinsic muscle it resembles *Grallaria* and *Hylactes*, as described by Garrod, as well as *Chamaza*, *Pteroptochus*, and *Formicarius*. In *Furnarius*, *Dendrocolaptes*, &c. this muscle is always present, and double. But in both *Grallaria*, *Hylactes*, and the others the *sterno-tracheales* muscles arise from the end of the vocal process. In *Conopophaga*, on the other hand, they leave the trachea before reaching that process.

<sup>1</sup> As defined by Sundevall, l. c. p. 57.

<sup>2</sup> L. c. p. 39, pl. vi. fig. 12. Garrod's ed. p. 32.

The peculiarity, therefore, of its sternum, when taken with its tarsal scutellation and peculiar syrinx, seems to demand that, as has already been proposed by Garrod, the genus *Conopophaga*<sup>1</sup> should form a primary division of the Tracheophone Passeres, which may be defined as follows:—

*Conopophagidæ*.—Tracheophonine Passeres, with a holorhinal skull and four-notched sternum, an exaspidean tarsus, and a syrinx with no intrinsic muscles, and with the *sterno-tracheales* not attached to the *processus vocales*.

As regards the possession of a four-notched sternum by these birds and the Pteroptochidæ, I am not inclined to consider it in any way a primitive character, but rather as an instance of a simple modification having been independently acquired in different groups of birds (many parallel cases might be given). The Tracheophonine syrinx must, without doubt, be regarded as a modification of some Haplophonine form<sup>2</sup>; and in all these last birds, as in the still less specialized Eurylæmidæ, the sternum has the typical form with but two notches. On the other hand, the similarity of form of the sternum in the Pteroptochidæ and Conopophagidæ may very probably indicate that these groups may both have sprung from some common stock which had already developed a peculiar sternum.

#### 4. Note on the Generic Name *Hyperpes*.

By ALFRED NEWTON, M.A., F.R.S., &c.

[Received March 15, 1881.]

My attention having been called by a note in the 'Zoological Record' (xvi. *Aves*, p. 28) to the prior use in entomology, by the Baron Chaudoir (Bull. Mosc. 1838, p. 8), of the generic name *Hyperpes*, conferred by me some years ago (P. Z. S. 1863, p. 85) on a bird discovered in Madagascar by my brother, I beg leave to substitute for the latter the name *Hypositta*<sup>3</sup>, and hope that this curious form will henceforth be known as *Hypositta corallirostris*.

<sup>1</sup> *Corythopsis* has not yet been anatomically examined; by Sundevall it is placed near *Formicarius*. It is therefore nearly certain to be Tracheophonine, and is probably really closely allied to *Conopophaga*.

<sup>2</sup> Garrod, P. Z. S. 1876, p. 517.

<sup>3</sup> Th. ὑπό, *sub*; σίτη, *Sitta*.

5. Descriptions of new Genera and Species of Phytophagous  
Colcoptera. By MARTIN JACOBY.

[Received March 5, 1881.]

Genus LAMPROSPHÆRUS, Baly.

1. LAMPROSPHÆRUS GIGAS, sp. nov.

Rotundate-ovate, convex. Metallic green; base of antennæ and the tarsi fulvous; thorax irregularly and rather finely, elytra more strongly, substriate-punctate.

Length 3 lines.

*Hab.* Peru.

Head distinctly and rather closely punctured, with a central longitudinal groove; clypeus wedge-shaped, distinctly separated from the face, impunctate; labrum and jaws black. Antennæ two thirds the length of the body, the three basal joints fulvous, the rest black. Thorax transversely convex, its sides much narrowed towards the base, posterior margin oblique at each side, the median lobe but little produced; surface closely and irregularly covered with larger and smaller punctures. Elytra very convex, with a slight transverse depression below the shoulders, the latter rather prominent; surface strongly and rather regularly punctate-striate, less strongly towards the apex. Underside and legs metallic green, tarsi fulvous.

In my collection.

The large size of this species will distinguish it from the others described, *L. tarsatus*, Baly, being most nearly allied to it; from that species, however, the metallic green upperside and the strong punctuation of the elytra separate it.

2. LAMPROSPHÆRUS SUBCOSTATUS, sp. nov.

Rotundate-ovate, convex. Black; base of antennæ and the legs and tarsi fulvous; above dark blue, shining; thorax finely and closely, elytra deeply punctate-striate, the interstices laterally costate.

Length 2 lines.

*Hab.* Bogota.

Head rugose-punctate; labrum fulvous. Antennæ subfiliform; the last five joints slightly dilated, piceous; first five joints fulvous. Thorax three times as broad as long, sides evenly rounded, finely margined with metallic green, surface closely but rather finely punctured. Scutellum ovate, smooth. Elytra as wide as the thorax, narrowed and rather pointed towards the apex; surface deeply and regularly punctate-striate, with three or four distinct costæ near the lateral margin. Underside black; legs entirely fulvous.

Collection Jacoby.

Genus PHÆDRA, Chapuis.

3. PHÆDRA BUCKLEYI, sp. nov.

Broadly ovate, subrotundate, convex. Below black; antennæ,

legs, and abdomen fulvous; above dark violaceous, shining, thorax greenish blue, closely punctured; elytra finely subpunctate-striate.

Length  $2\frac{3}{4}$  lines.

*Hab.* Ecuador.

Head dark blue, opaque, rather deeply depressed between the eyes; this depression, as well as the clypeus, rugose; rest of the surface remotely but distinctly punctured. Labrum, palpi, and the antennæ fulvous; last seven joints of the latter distinctly thickened, and extending to half the length of the body. Thorax three times as broad as long, very convex, of a greenish leaden colour, the sides finely margined with metallic green; surface with a few obsolete depressions near the base, very closely and rather finely punctured. Scutellum broader than long, its apex broadly rounded, extremely finely punctured. Elytra very dark violaceous blue, not wider than the thorax, the shoulders rather prominent, more finely punctured than the thorax, the punctures placed in rather regular rows, and distinct to the apex. Underside black, abdomen fulvous.

In my collection.

#### Genus AULEXIS, Baly.

##### 4. AULEXIS ELONGATUS, sp. nov.

Elongate; fulvous, subnitidous, covered with long whitish hairs; antennæ, their three basal joints excepted, and the tibiæ and tarsi black; thorax deeply transversely depressed, three-dentate.

Length  $2\frac{3}{4}$  lines.

*Hab.* Java.

Head rather closely punctured, more deeply at the lower part, anterior margin of epistome with two teeth. Antennæ extending not much further than the commencement of the elytra, the third and fourth joints equal, the rest gradually widened, three lower joints fulvous, the rest black. Thorax finely punctured, with a deep oblique transverse depression across the disk, the sides armed with three acute teeth, the third being rather obsolete. Scutellum elongate, subquadrate. Elytra convex, more than three times as long as the thorax, punctured in the same way, and covered with long silky whitish hairs. Underside fulvous, tibiæ and tarsi black.

Collection Jacoby.

From the three other species described by Mr. Baly the present one is distinguished by its coloration in connexion with its size.

In Dr. Chapuis's remarks on this genus, I find the eyes mentioned as being separated by a narrow space only; this is a mistake, as, on the contrary, they are very widely apart.

#### Genus NODA, Chapuis.

##### 5. NODA UNICOSTATA, sp. nov.

Oblong-ovate, moderately convex. Below greenish blue; above metallic aureous, five basal joints of antennæ fulvous; thorax and elytra finely punctured, the latter with a lateral costa posteriorly.

*Var.* Entirely metallic green above.



Length  $2-2\frac{1}{2}$  lines.

*Hab.* Maué, Amazons.

Front of the head swollen, minutely punctured, with a faint longitudinal central groove; clypeus separated from the face by an obsolete triangular groove, its surface finely rugose-punctate. Labrum metallic green. Antennæ extending to the base of the thorax, their five apical joints transverse, distinctly broader than long, black, basal joints more or less fulvous. Thorax transversely convex, much widened at the base, from there to the apex narrowed and much reflexed anteriorly, surface very minutely punctured. Scutellum semicircular, broader than long. Elytra scarcely more than twice as long as the thorax, very convex, a little more strongly punctured than the thorax, the punctuation arranged in regular rows, each elytron with a distinctly raised costa near the lateral margin from the middle to the apex. Legs robust, dark metallic blue.

A variety is of a larger size, and of a metallic green colour above, but does not differ in other respects.

Collection Jacoby.

#### Genus COLASPOSOMA, Casteln.

##### 6. COLASPOSOMA GIBBICOLLE, sp. nov.

Oblong, convex. Dark blue; head strigose laterally, aureous; thorax convex, closely and deeply punctured, dark blue; elytra aureous, the suture broadly, extreme lateral margin narrowly, dark blue.

Length  $4-4\frac{1}{2}$  lines.

*Hab.* Zanzibar.

Head closely punctured, shallowly depressed in the middle, the sides obliquely strigose. Antennæ of half the length of the body, black; the first joint globular, second short, third joint longer than the fourth, last five joints widened. Thorax about twice as broad as long, very convex, the sides much rounded, anterior angles distinct, posterior margin nearly straight at the sides, rounded at the middle, surface densely and deeply punctured. Scutellum distinctly punctate. Elytra nearly three times as long as the thorax, moderately convex, rounded towards the apex; surface very closely transversely rugose at the sides, punctate-rugose near the suture, extreme apex finely pubescent. Underside and legs dark blue, pubescent.

Of this handsome species I possess six specimens, which do not differ except in size; besides the well-marked pattern of the elytra, the convexity of the thorax and its rounded lateral margin will easily distinguish this species from others.

##### 7. COLASPOSOMA APICALE, sp. nov.

Oblong, ovate, convex. Æneous below, closely pubescent; labrum and antennæ fulvous, above metallic green; thorax finely, elytra more strongly punctured, the extreme lateral margin and the apex aureous.

Length 3 lines.

*Hab.* Transvaal.

Head closely covered with rather deep oblong punctures, anterior margin of the epistome deeply concave emarginate; labrum fulvous. Antennæ scarcely extending to one third the length of the body, obscure fulvous, the fifth to the apical joints closely pubescent. Thorax transversely convex, its sides rounded and subangulate at the middle, surface punctured like the head, the interstices extremely finely granulate, metallic green, anterior angles more or less distinctly aureous. Scutellum of the same colour or metallic green, broader than long, finely granulate, with some deep punctures. Elytra elongate, narrowed and acute at the apex, longitudinally depressed in front of the humeral callus, surface deeply and closely punctured, the interstices, especially near the sides, coarsely transversely rugose, the extreme apex and the margins aureous; inflexed limb of the elytra of the same colour. Legs æneous, with a violet reflection.

Two specimens are contained in my collection.

8. *COLASPOSOMA TARSALE*, sp. nov.

Elongate, subparallel. Metallic green below; above opaque green, basal joints of antennæ and the legs fulvous; tarsi black; thorax and elytra densely punctured, the latter transversely rugose throughout.

Length 3 lines.

*Hab.* Africa.

Head strigose at the extreme vertex, densely and deeply punctured at its lower part; clypeus separated from the front by a semi-distinct transverse smooth ridge, its lower part finely rugose punctate. Labrum fulvous. Mandibulæ metallic green at the base. Palpi fulvous, their apex piceous. Antennæ of half the length of the body, first three joints fulvous, the rest piceous. Thorax transverse, convex, its sides rounded, surface covered throughout with deep punctures, green, opaque. Scutellum impunctate, broader than long. Elytra elongate, not depressed below the base, slightly narrowed and rounded towards the apex, their surface covered throughout with transverse wrinkles, the interstices punctate. Under-side green, shining; legs fulvous; tarsi black; anterior legs elongated.

One specimen in my collection.

The opaque colour of its upper parts, together with the black tarsi and fulvous legs, will separate the present species from others, especially from *C. instabile*, Har., and *C. femorale*, Lefèv.

9. *COLASPOSOMA LONGIPES*, sp. nov.

Oblong. Cupreous below; head aureous, remotely punctured; antennæ, labrum, and legs fulvous, the anterior ones elongate; thorax finely, elytra strongly substriate-punctate, metallic green.

Length 3 lines.

*Hab.* Transvaal.

Head very distantly, clypeus closely punctured, aureous; mandibulæ robust and rather long. Antennæ of half the length of the body, fulvous, the joints elongate, but slightly thickened. Thorax convex, rather long, about twice as broad as long, the sides very rounded, surface finely and rather closely punctured, metallic green, with a faint cupreous tint near the posterior angles. Scutellum as broad as long. Elytra elongate, convex, slightly narrowed at the apex, the base distinctly swollen; surface much more strongly punctured than the thorax, the punctures arranged in almost regular rows, interstices at the sides slightly transversely wrinkled. Anterior legs very elongate.

One specimen, contained in my collection.

The elongate anterior legs, very remote and fine punctuation of the head, and the nearly regular rows of punctures of the elytra will make this species recognizable amongst its allies; it is distinguished from *C. thoracicum*, Lefèv., by the rufous tarsi, and the basal elevation of its elytra.

10. *COLASPOSOMA MELANCHOLICUM*, sp. nov.

Oblong-ovate. Dark æneous; antennæ black; above closely punctate, rugose, covered with whitish pubescence, each elytron with four or five longitudinal obsolete costæ.

Length 3 lines.

*Hab.* Transvaal.

Head closely rugose-punctate, with a smooth central line. Antennæ black, extending to one third the length of the body, third and following joints of nearly equal length. Thorax narrowly transverse, nearly three times as broad as long, convex, and its sides deflexed; surface very closely rugose and punctate, and covered with thin white pubescence. Scutellum not covered with hairs, punctured. Elytra convex, rounded posteriorly, rugose and punctured like the thorax, and pubescent like the latter, each elytron with four or five longitudinal costæ from the base to the apex, at which place they closely approach each other. Underside and legs of the same colour, and pubescent like the upper surface.

One specimen is contained in my collection.

There seem to be several species closely allied to the present one — *C. vestitum*, Thoms., *C. pubescens*, Lefèv., and *C. subcostatum*, Gerst. From the first it is distinguished by the transverse thorax and by the colour of its antennæ and legs, from the second by the elytral costæ and greater size, while the pubescence separates it from the third species.

11. *COLASPOSOMA VARIABLE*, sp. nov.

Oblong. Æneous below; above metallic green; head with two, thorax and elytra with four longitudinal dark purplish bands.

*Var.* Entirely greenish or brownish æneous.

Length 4–4½ lines.

*Hab.* Zanzibar.

Head deeply and closely punctured, dark purplish, a central lon-

gitudinal short band and the clypeus metallic green. Antennæ like those of the preceding species. Thorax narrowly transverse, sides nearly straight at the base, thence to the apex slightly rounded; surface very closely punctate near the sides, more remotely at the disk, metallic green, this colour divided by four longitudinal bands, of which the two middle ones are the broadest, but do not quite touch the apex, the bands placed at nearly equal distance from each other, another shorter purplish spot is placed on each side at the extreme lateral margin. Scutellum depressed at its base, deeply punctured. Elytra of exactly the same shape and sculpture as in *C. gibbicolle*, metallic green, each elytron with a subsutural broad dark purplish band, and another lateral one, both uniting at their apex. Underside and legs æneous, finely pubescent, anterior femora with a very short tooth.

A variety does not differ except in its uniform colour of green or brownish æneous but in certain lights traces of the darker bands are also here visible.

#### 12. COLASPOSOMA ANTENNALE, sp. nov.

Broadly ovate, convex. Metallic green or æneous; antennæ and legs fulvous, the former long, filiform; thorax and elytra deeply punctured, interstices of latter transversely rugose throughout.

Length 3-3 $\frac{3}{4}$  lines.

*Hab.* South Africa.

Head longitudinally strigose at the vertex, closely punctured at the middle; clypeus divided from the front by a distinct transverse angulate groove, closely punctured near the lower margin. Labrum narrow, fulvous. Antennæ as long as half the body in the male, slender, all the joints elongate, the terminal ones not thickened, fulvous, apex of apical joints piceous. Thorax transverse, convex, rather broad, sides much rounded, angles acute, the anterior ones thickened and produced into a point; surface closely and deeply punctate at the sides, less so at the disk, the middle of which is partly smooth and impunctate. Scutellum rugose punctate, not broader than long. Elytra oblong, convex, slightly narrowed towards the apex, surface very closely and deeply punctate and transversely rugose. Abdomen finely rugose, very finely pubescent.

Specimens which I refer to the female insect have the antennæ a little shorter and the thorax less transverse.

In my collection.

To be distinguished from *C. senegalense*, Cast., by its denser punctuation of the thorax and elytra, more elongate shape, and the different antennæ; from *C. chloris*, Lefèv., by the close transverse rugosities which cover nearly the entire elytra, while *C. femorale*, Lefèv., has differently coloured legs and antennæ.

#### 13. COLASPOSOMA ORNATICOLLE, sp. nov.

Oblong, convex. Black; legs, breast, and head purplish blue; thorax aureous, densely punctured; elytra purplish, the suture metallic green.

Length 3 lines.

*Hab.* Cochin China.

Head purplish, deeply but moderately closely punctured. Labrum fulvous. Antennæ half the length of the body, dark fulvous, the apical joints black, basal joint purplish above. Thorax transversely convex, three times as broad as long, sides very deflexed and rounded, narrowed anteriorly, with a narrow metallic green margin; surface very deeply and closely punctured, aureous. Scutellum of the same colour, punctured. Elytra oblong, transversely depressed below the base with a longitudinal row of round tubercles from below the shoulder to two thirds of their length; rest of the disk punctured like the thorax, slightly transversely wrinkled at the sides, purplish; a sutural stripe, widened towards the apex, and the extreme lateral margin metallic green. Legs and breast greenish blue; tarsi and the abdomen black.

In my collection.

The shorter antennæ, colour of the head, and other characters will easily distinguish this species from *C. ignicolle*, Baly.

14. *COLASPOSOMA ORNATUM*, sp. nov.

Oblong-ovate, convex. Black; above aureous, rather finely punctured; anterior margin of the thorax, the base and sutural margin of the elytra, and a narrow angulate longitudinal stripe on the disk of each elytron metallic blue.

*Var.* Head and thorax dark blue.

Length 3 lines.

*Hab.* India.

Head deeply but not closely punctured, strigose at the sides; epistome rugose, punctate at the base, with an obtuse tubercle at the middle; upper part of the head aureous, space in front of the antennæ and sides of the epistome metallic blue; labrum, antennæ, and palpi black. Thorax three times as broad as long, its sides rounded, and the anterior angles produced into an acute point; surface moderately deeply punctured throughout, the punctuation scarcely finer at the disk than at the sides, anterior margin narrowly metallic blue. Scutellum nearly as broad as long, metallic green. Elytra scarcely depressed below the base, convex, rather more finely punctured than the thorax, except below the shoulder, where the punctuation is strong and the interstices are slightly wrinkled; the colour is the same as that of the thorax, extreme base and the margins metallic blue; at the middle of the disk a narrow longitudinal band of the same colour extends from below the base to two thirds the length of the elytra, and sends off a short transverse band anteriorly at right angles towards the suture, without, however, touching the latter. Legs and underside black, sides of the breast metallic green.

Of this species I possess four specimens, which, except the variety mentioned above, agree in coloration, but not in sculpturing, some being much more strongly punctured than others, which difference might be sexual; they may, however, possibly belong to another

species, as the habitat of the type alone is known to me, the other three being without locality.

15. *COLASPOSOMA ROBUSTUM*, sp. nov.

Subquadrate-oblong, robust. Metallic green or blue; above metallic green, rather finely punctured, suture and a transverse short band below the base of the elytra purplish.

*Var.* Above entirely metallic green.

Length 4-5 lines.

*Hab.* India, Neilgherries.

Head rather finely and remotely punctured, the front swollen, with a deep impression between the eyes; upper part of the epistome longitudinally rugose. Labrum and palpi black. Antennæ of half the length of the body, the six lower joints dark blue, the rest black, opaque. Thorax transversely convex, its sides rounded; surface not closely, but distinctly punctured, the punctures not stronger than those of the head. Scutellum broad, subquadrate. Elytra wider at the base than the thorax, subquadrate, convex, transversely impressed below the basilar space, where the punctuation is deep and strong, and more or less deeply transversely rugose; rest of the surface punctured like the thorax, but more finely towards the apex. Underside and legs metallic green or blue.

Six specimens are contained in my collection:

The large size and rather fine punctuation distinguish the present species from the others, especially from *C. pretiosum*, Baly, from which it is moreover separated by the uniform colour of the tarsi and legs and the want of the tooth of the anterior femora.

*Colasposoma sellatum*, Baly (1878) = *C. barbatum*, Harold (1879).

*Colasposoma instabile*, Harold (1877) = *C. varians*, Baly (1878).

Genus *EUBRACHYS*, Dej.

16. *EUBRACHYS APICALIS*, sp. nov.

Oblong, subdepressed. Metallic green, sides of the thorax and part of the head black; above rugose, posterior part of the elytra striate-punctate, black; legs cupreous, femora acutely dentate.

Length  $2\frac{1}{2}$  lines.

*Hab.* Cameroons.

Head elongate, closely rugose punctate, the vertex strigose, blackish, lower part cupreous, anterior margin of the epistome distinctly concave, apex of jaws black. Antennæ gradually widened towards the apex, black, basal joint cupreous. Thorax cylindrical, scarcely wider at the middle, metallic green at the disk, sides black, surface closely punctate and transversely rugose. Scutellum subpentagonal, metallic green. Elytra much wider at the base than the thorax, narrowed towards the apex, anterior portion metallic green, closely covered with distinct granulations, apical portion deeply punctate-striate, black, somewhat shining, extreme apex finely pubescent. Underside closely pubescent, legs elongate, rugose-punctate, cupreous, all the femora with an acute long tooth. Apical margin of the anterior epistome concave.

Two specimens are contained in my collection.

Mr. Baly has lately separated the genus *Pseudocolaspis* into two sections, founded upon the convexity or concavity of the anterior margin of the episternum, retaining for the latter section Dejean's name of *Eubrachys*. The present species belongs to this group according to this arrangement.

#### AURANIUS, nov. gen.

Oblong-ovate, moderately convex; face perpendicular; eyes slightly emarginate; antennæ half the length of the body, the last five joints dilated; maxillary palpi subfiliform, apical joint elongate, its apex subacute; thorax subcylindrical, very convex, its sides dentate at the middle; elytra much wider than the thorax, narrowed posteriorly, longitudinally rugose, the interstices transversely wrinkled and deeply punctate; legs short, robust, tibiæ widened at the apex and compressed, claws appendiculate; prosternum longer than broad, narrowed at the middle, its base truncate; anterior thoracic episternum convex.

Type *Auranius robustus*.

On account of the anterior convex episternum, the present genus must be placed amongst the second division of the Eumolpidæ. While it agrees in general form of the body with the genus *Corynodes*, the dentate lateral margin and great convexity of the thorax will easily distinguish it from that and any other genus of the second group of this family.

#### 17. AURANIUS ROBUSTUS.

Bronze-coloured, submetallic, pubescent below; labrum, palpi, and antennæ fulvous, joint 7 and the apical ones piceous; thorax coarsely longitudinally rugous, its sides tridentate; elytra oblong, irregularly longitudinally and transversely rugose.

Length 4-4½ lines.

*Hab.* Brazil.

Head elongate, closely rugose and strigate, space in front of the eyes with two transverse smooth raised elevations, anterior border of the clypeus truncate; mandibulæ robust. Labrum and palpi fulvous, apical joints of the latter piceous. Antennæ about as long as half the body, the third joint more than twice as long as the second, the seventh to the apical joints distinctly widened, fulvous, joint 7 and 10 and 11 piceous. Thorax subcylindrical, the anterior half very convex and raised, the elevation divided at the top by a narrow longitudinal groove from base to apex, lateral margin distinctly tridentate, the anterior angles subtuberculiform; surface closely and coarsely longitudinally rugose and deeply punctured. Scutellum broader than long, convex, smooth. Elytra much wider at the base than the thorax, gradually narrowed towards the apex, moderately convex, each elytron with about 6 rows of interrupted highly raised smooth costæ, connected partly by other transverse rugosities, the interstices deeply punctured. Legs very robust, tibiæ greatly widened

anteriorly, first anterior tarsal joint greatly dilated and subquadrate (male?), claws appendiculate.

Two specimens of this interesting insect were kindly given to me by Dr. Baden of Altona.

Genus COLASPOIDES, Casteln.

18. COLASPOIDES AMAZONA, sp. nov.

Oblong, convex. Underside, the legs, and antennæ fulvous; above bright metallic green, finely punctured.

Length 3 lines.

*Hab.* Maué, Amazons.

Front of the head swollen, with a fine longitudinal central groove, distinctly but remotely punctate, epistome broader than long, distinctly separated from the face by a deep groove, rugose punctate. Labrum fulvous; apical joint of the palpi and the jaws black. Antennæ extending to one third the length of the body, entirely fulvous. Thorax about three times as broad as long, narrowed in front, the sides much deflexed anteriorly, surface irregularly and remotely covered with larger and finer punctures, which disappear entirely near the anterior margin. Scutellum subtriangular, impunctate. Elytra nearly four times as long as the thorax, narrowed near the apex, convex, rather regularly but finely punctate-striate, the punctures not stronger than those of the thorax. Entire underside and legs fulvous.

The colour of the underside will distinguish this species from any other described South-American form.

GALERUCIDÆ.

NEOCHARIS, n. gen.

Elongate, parallel; head elongate, longer than broad, perpendicular; palpi elongate, subapical joint thickened at the apex; antennæ filiform, joint 3 dilated, swollen; thorax slightly broader than long, surface with two round impressions; scutellum trigonate, convex; elytra broader than the thorax, impressed below the base, confusedly punctate; legs slender, tibiæ unarmed, claws appendiculate; prosternum invisible; anterior coxal cavities closed.

Type *Neocharis fulvicollis*.

The above characters show that this genus must be placed amongst Chapuis' 26th group, the *Platyxanthidæ*, which contains at present four genera. The present one is distinguished by having the *third* joint of the antennæ greatly dilated, probably only in the male sex, this dilatation being transferred in the genus *Doridea* and *Platyxantha* to the apical joints.

19. NEOCHARIS FULVICOLLIS, sp. nov.

Elongate, parallel. Black below; head, antennæ, and thorax fulvous; elytra finely punctate and obsoletely costate, bluish black; extreme base, anterior lateral and sutural margins, and two round apical spots, fulvous.



Length 3 lines.

*Hab.* Java.

*Var.* Elytra bluish black; a transverse band before the middle, deeply 3-dentate at its anterior margin, flavous.

Head elongate, scarcely narrowed towards the apex; space between the eyes obsoletely, transversely, and longitudinally grooved; eyes rounded, entire; vertex and entire face impunctate, shining fulvous; anterior margin of epistome emarginate. Antennæ as long as the body, fulvous, first joint club-shaped, second joint very short, moniliform, third elongate, subquadrate, greatly dilated and deeply foveolate at its outer surface, fourth to the eleventh gradually lengthened, cylindrical and elongate, apex with a short but distinct twelfth joint. Thorax nearly square-shaped, sides widened towards the middle, but constricted near the base, surface with two small round foveæ behind the middle, finely punctured, fulvous. Scutellum black. Elytra distinctly transversely depressed below the base, more deeply punctured than the thorax, with indistinct traces of longitudinal costæ, metallic bluish black; the extreme base, anterior lateral and sutural margins, and a large round apical spot of each elytron fulvous. Below black, anterior half of the elytral epipleuræ fulvous; femora and part of the tarsi flavous, first joint as long as the two following united.

The variety does not differ in any way except that of colour.

#### Genus CHTHONEIS, Baly.

##### 20. CHTHONEIS MARGINICOLLIS, sp. nov.

Elongate, slightly widened behind. Black, sides of the thorax and the femora testaceous; elytra dark violaceous, extreme lateral margins anteriorly flavous.

*Var.* Elytra entirely unicolorous.

Length 4 lines.

*Hab.* Peru.

Head impunctate, deeply transversely grooved, space immediately above the antennæ with two distinct callosities; clypeus wedge-shaped, its anterior margin straight. Antennæ incomplete, joints second and third very small; the following joints elongate, dilated and compressed, the fourth joint the longest. Thorax nearly three times as broad as long, posterior margin rounded and produced in the middle, lateral margin much widened at the middle, distinctly marginate, anterior angles slightly thickened, rounded and oblique; surface very minutely punctured, 3-foveolate (one at each side and one near the middle of the base), black, the sides broadly flavous. Scutellum large, black, impunctate. Elytra rather convex, closely and distinctly punctured, dark violaceous, extreme lateral margin from the base to behind the middle flavous. Underside and legs black, femora flavous; claws rather largely appendiculate.

Two specimens are contained in my collection.

Although this species is more robust and of larger size than the others belonging to this genus, the general characters agree well

with the type. The dilated middle joints of the antennæ, unarmed tibiæ, and open anterior coxal cavities, together with the length of the posterior tarsal joint, are the characteristic marks of the present genus.

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April 5, 1881.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of March 1881:—

The total number of registered additions to the Society's Menagerie during the month of March was 71, of which 29 were by presentation, 6 by birth, 19 by purchase, 12 were received on deposit, and 5 by exchange. The total number of departures during the same period, by death and removals, was 99.

The most remarkable additions during the month of March were as follows:—

1. A young male Gooral Antelope (*Nemorhædus goral*) from the Himalayas, purchased 16th of March, being the first example of this fine species that we have received.

2. Three Birds of Paradise belonging to the following species:—the Twelve-wired Bird of Paradise (*Seleucides alba*); the Red Bird of Paradise (*Paradisæa rubra*); and the Green Manucode (*Manucodia chalybea*), deposited the 19th March by Mr. William Jamrach, and to become the property of the Society if they shall be alive and in good condition one month after their arrival.

These birds are not at present in fine plumage, but appear to be healthy and are doing well. They are all of species new to the collection.

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The Secretary stated that, the two smaller Indian Elephants deposited in the Gardens by the Prince of Wales on May 17th, 1876, being about to be sent to the Zoological Garden at Berlin, he had caused them to be weighed and measured, in order to obtain a record of their growth during the past two years. The same had been done with the two larger Indian Elephants; and the following were the results, which might be compared with the weight and measurements taken in May 1879, and given P. Z. S. 1879, p. 385.

	Height at shoulder.	Circumference of the front foot above the toes.	Weight.		
	ft. in.	ft. in.	cwt.	qr.	lb.
Jung Pershád (♂) ..	8 0	4 0	57	1	23
Suffa Culli (♀) ....	7 6	3 9	51	0	23
Rustum (♂) .....	6 4	3 2	26	0	0
Omar (♂) .....	7 0	3 6	35	1	21

It appeared therefore that in two years these four animals had increased as follows:—

	Height at shoulder.		Circumference of front foot.		Weight.		
	ft.	in.	in.		cwt.	qr.	lb.
Jung Pershád . . . . .	1	0	4		14	1	0
Suffa Culli . . . . .		8	1		8	1	12
Rustum . . . . .		4	3		2	0	2
Omar . . . . .		10	4		8	0	16

The Secretary also read an extract of a letter from the Maharajah of Bulrampur, dated 23rd October, 1880, addressed to Sir Joseph Fayrer, K.C.S.I., which showed the exact age of Suffa Culli. It stated that she was born in the Maharajah's kheddah after her mother's capture, on the 23rd of April, 1871.

Jung Pershád had been given to the Prince of Wales in the Terai of Nepal by Sir Jung Bahawdur in Feb. 1876, at which time he was believed to be about six years old.

Mr. Selater laid on the table five birdskins which had been accidentally misplaced among other collections of the 'Challenger Expedition,' and consequently had not been included in his reports on this subject.

These skins, which had been obtained by the Rev. G. Brown, C.M.Z.S., from the island of Rotumeh, and presented to the Naturalists of the 'Challenger,' belonged to the following species:—

1. *Pinarolestes vitiensis* (Hartl.); Sharpe, Cat. B. iii. p. 299; or a subspecies of this form.

2. *Lalage pacifica* (Gm.); Sharpe, Cat. B. iv. p. 97.

3. *Myzomela chermesina*, G. R. Gray; Forbes, P. Z. S. 1878, p. 351, et 1879, p. 273. Two examples of this fine species.

4. *Strepsilas interpres*, Linn.

Mr. Selater observed that three species were thus to be added to the list of known birds of Rotumeh as given by Mr. Forbes, P. Z. S. 1878, p. 351.

Mr. Selater also laid upon the table two birds which had been obtained in New Britain by Mr. Kleinschmidt, the collector of the Museum Godeffroy in New Britain, and had been forwarded to Mr. Selater for determination by Mr. Schmeltz, of the Museum Godeffroy.

Mr. Selater considered both these birds to be referable to undescribed species, and proposed to characterize them as follows:—

1. *TRICHOGLOSSUS RUBRIGULARIS*, sp. nov.

*Trichoglossus rufigularis*, Kleinschm. in litt.

*Suprà viridis, alis intus nigris extus dorso concoloribus, subtus dilutior, et præcipuè in gutture et in lateribus flavicantior; guld summâ coccineo-rubrà; capitis lateribus latè gramineo-viridibus; alarum paginâ inferiore schistaceo-nigrâ, remigum pogoniis inter-*

*nis ad basin flavo transvittatis; subalaribus flavicanti-viridibus; caudâ subitè schistaceo-nigrâ, rectricum apicibus latis flavis, et harum quatuor utrinque extimarum pogoniis internis ad basin sanguineo-rubris; rostro flavo, pedibus pallidè carneis, unguibus nigris. Long. tota 6·7, alæ 3·4, caudæ valde graduatæ rectr. ext. 1·5, med. 3·2.*

*Hab.* Nova Britannia (Kleinschmidt).

*Obs.* This beautiful little Parrakeet is quite new to me, but seems to belong to the section including *Tr. palmarum* and its allies (Finsch, Papag. ii. p. 869.) The description is taken from a female; but Mr. Kleinschmidt says the sexes are nearly alike in plumage. He obtained his specimens in December last near Balura in the Blanche-bay district of New Britain. "Iris yellowish red, bill yellowish red with darker point, feet red; native name *Airara*." I have slightly altered Mr. Kleinschmidt's MS. name for this bird, as the chin-spot is not brown (*rufus*), but nearly crimson (*coccineo-ruber*).

## 2. ORTYGOCICHLA RUBIGINOSA, sp. et gen. nov.

ORTYGOCICHLA<sup>1</sup>, gen. nov. ex fam. *Timeliidarum*.

*Dasyornithi forsan affine, sed rostro compresso elongato, vibrissis rictûs nullis, aut saltem vix conspicuis et frontis plumis exstantibus diversum; uropygium valdè plumosum; alæ modicæ rotundatæ, rem. quarto et sequentibus ad novum inter se fere æqualibus; pedes validiusculi, digitis amplis; caudâ rectricibus xii, valde graduatis.*

### ORTYGOCICHLA RUBIGINOSA, sp. nov. (Plate XXXIX.)

*Suprà terreno-fusca, alis et caudâ extûs rufescentibus; fronte, superciliis, capitis lateribus et corpore medio subitè ferrugineo-rubris; hypochondriis dorso concoloribus; rostro nigro, pedibus corylinis. Long. tota 7·5, alæ 3·3, caudæ rectr. med. 3·5, ext. 2·0, rostr. a rictu 0·9, tarsi 1·2.*

*Hab.* Nova Britannia (Kleinschmidt).

*Obs.* This is apparently a new form of Timeline bird, and quite unknown to me. Mr. Kleinschmidt obtained it in November last near Bakalai, in the Blanche-bay district of New Britain, and gives notes, of which the following are a translation:—

"Lives on the ground, and runs with head projecting forwards like a Quail. When in captivity it retired at night into a bundle of grass placed in the corner of its cage on the ground to sleep. Here, suddenly expanding its long dorsal feathers, sinking its rounded wings, and drawing in its head, it looked like a loose round bundle of brown grass-stalks. Food grasshoppers. Iris bright grey, with a light-brown tinge; bill dark horn-colour above, almost black, beneath brighter; legs, feet, and claws dark horn-colour. Native name *Talberara*. Breeds in November and December, and said to lay in a hollow in the ground without any nest."

An egg sent with the bird (see Plate XXXIX.) is very densely and

<sup>1</sup> ὀρτυξ, *coturnix*, et κίχλη, *turdus*.

flesh upon a large Manatee, and he is a very heavy beast, his bones being enormously thick and strong."

This letter was also found among his papers, evidently in answer to inquiries he had made:—

"S.S. Gaboon, 15th Oct. 1879.

"R. B. Dobree, Esq.

"DEAR SIR,—

"With reference to the conversation we had respecting the *Amanaty*, I have much pleasure in giving you the following information, facts well known by all European traders and missionaries stationed in Old Calabar.

"The *Amanaty* is well known as going ashore at quiet places after sunset, about 30 miles up the river, and feeding on grass which grows freely amongst Indian corn. To prevent him doing so much harm to the corn, natives have fires burning during the night, the latter acting in this case as scarecrows at home.

"I may also add that freemen and all chiefs of Old Calabar have a secret feeling similar to freemasonry at home; and at any time a chief wishes to become a member he must either buy or catch an *Amanaty* as a gift to the members of the native society; and it is well known that the natives watch the *Amanaty* going ashore, and when he is a good way into the cornfields they will stake him with bamboos and so, in many cases, catch him.

"I remain, Yours very truly,

"H. HARTYE,

"Agent for Messrs. Thomas Harrison, Liverpool."

These statements are very precise as to the power of free terrestrial locomotion in the animal, and so opposed to the conclusions to which I referred at the beginning of this note that I felt that they ought not to be withheld from publication. I must, however, still confess that a doubt arises in my mind whether there may not have been some confusion (perhaps arising from imperfect comprehension of language) in the minds of the native informants (for the habits and appearance of the two animals were, of course, perfectly well known to Mr. Dobree) between the Hippopotamus and the Manatee, more especially as the second mode of trapping the Manatee with the beam of wood and cord described by Mr. Dobree is exactly the same as that used in many parts of Africa for killing the first-named animal. Thus Livingstone tells us that "both banks of the river Zambesi near the Mboma village are dotted with Hippopotamus-traps over every track which these animals have made in going up out of the water to graze."... "The trap consists of a beam five or six feet long, armed with a spear-head or hard wooden spike covered with poison, and suspended to a forked pole by a cord which, coming down to the path, is held by a catch, to be set free when the beast treads on it."

The valuable observations lately published by Dr. Murie<sup>1</sup> and Dr. Chapman<sup>2</sup> upon the actions and habits of living Manatees in con-

<sup>1</sup> Trans. Zool. Soc. vol. xi. p. 19.

<sup>2</sup> Proc. Acad. Nat. Sciences of Philadelphia, 1875, p. 452.

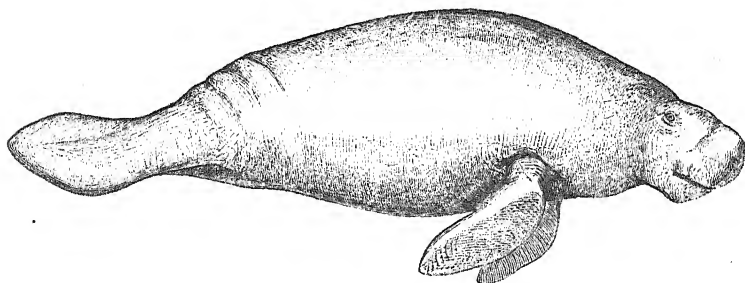
finement having thrown little if any light upon this question, I wished to avail myself of the chance recently afforded of closely observing the movements of a pair of these animals in the Brighton Aquarium, and have on several occasions endeavoured to ascertain how far their behaviour in captivity would corroborate the above-quoted statements. My opportunities for doing so have, however, not been so frequent as those of Miss Crane, a constant and very observant visitor at the Aquarium; and she has therefore, at my request, drawn up the following notes, which contain much of interest in relation to the subject particularly in question, and also concerning the movements and habitual position of the animals in the water. These, as I have frequently noticed myself, differed greatly from those so carefully observed by Dr. Murie, especially in the circumstance that the Brighton animals never rested upon the dorsal surface of the tail, but always upon the ventral surface or extremity of that organ, if they allowed it to touch the bottom at all. It must, however, be remarked that the confined space in which the animals were kept in both cases and the different depth of the water rendered the observations less satisfactory than they might be. A large tank with a gradually shelving bottom rising from deep water at one end to dry land at the other would afford a better means of solving these problems.

2. Notes on the Habits of the Manatees (*Manatus australis*) in Captivity in the Brighton Aquarium. By AGNES CRANE. Communicated by Professor FLOWER, Pres.Z.S.

Two young Manatees (*Manatus americanus*, male and female) from the island of Trinidad arrived in Liverpool in September 1879, were purchased for the Brighton Aquarium, and have since been on view in that Institution. A young female had been obtained a few months previously from the same island; but this specimen, after living for some weeks in apparent health and feeding well, died suddenly from acute intestinal inflammation. As these interesting aquatic mammals have not yet become common in aquaria, observations on the habits of the Brighton specimens may be worth recording for comparison with those already noted.

The young male, a fine animal in robust condition, measured in November 1879 four feet ten inches from snout to tail, with a maximum girth of four feet. The female was four feet eight inches in length, of a lighter slate-colour than her companion, of more slender build and proportions. Both are marked with white on the underside of their bodies. The pair occupied a tank twelve feet six inches in length by eight feet six inches in breadth, with an almost flat bottom. Temperature of water about 70° Fahr; depth two feet six inches in the daytime, reduced six inches at night. The water is run off daily, a fresh supply being admitted at the requisite heat from a neighbouring tank filled with warmed fresh water. Although

the area of these quarters appears somewhat limited when compared with the bulk of the animals, the Manatees seem perfectly comfortable and, being of a sluggish disposition, rarely explore the whole of their small domain. Nor do they, so far as I have observed, avail themselves of the shallowness of the water and, by supporting their bodies on the tail-fin, keep their heads above the surface and avoid the constant repetition of the upward movement in order to breathe the necessary air. They habitually rest side by side at the bottom of the tank, with the caudal fin stretched out quite straight, and the tips of the fore fins just touching the ground (see sketch).



Sketch of the Manatee in the Brighton Aquarium.

Thence they rise gently, often with the least perceptible movement of the tail and flapping motion of the paddles, raising the upper part of the body until the head reaches the surface, when the air is admitted through the nostril flap valves, which are closely shut after the operation, and the original and usual position is gently resumed. They seem generally to be compelled to rise to the surface for aerial respiration every two or three minutes; but the interval between respiration varies much at different times. In one quarter of an hour, during which one was carefully timed, it rose nine times, at very irregular intervals. I have been informed that they occasionally remain under water for a much longer period; but have never observed them to exceed six minutes, although I have timed them before and after feeding, and at all hours of the day. The respiratory movement appears to be repeated almost mechanically and without effort.

When the water is run off in the early morning, the animals are left stranded on the floor; and the strength latent in the caudal fin becomes apparent, as it is struck violently on the dry floor of their tank when they are approached or disturbed. But the Manatees rarely make any serious attempt at progression, merely rolling lazily over from side to side. Indeed the small fore paddles seem ludicrously inadequate for the support of the unwieldy body in the act of terrestrial locomotion, although the animals move with easy grace in their native element. The fore fins are then often employed, when swimming slowly, the tips being applied to the

ground, as represented in the accompanying sketch (p. 457) from the pencil of my friend Mr. Thomas Davidson, F.R.S. They are moved backwards and forwards either singly or both at the same time. The extreme flexibility of these limbs, which resemble a human hand cased in a fingerless glove, is very remarkable. They are turned simultaneously or separately in their sockets in every direction, applied to their bodies and frequently to their mouths. The food is often gathered between their palmar surfaces and held up to their highly mobile lips. The animals are intelligent, recognize the voice and person of their keeper, W. Wells, and (while resenting the intrusion of a stranger in their tank) allow him to approach and brush them down daily to cleanse the upper surface of their bodies, and apparently enjoy the operation. Their movements in the water are very sluggish, as a rule; but signs of excitement and unusual efforts in the male were noticed under the following circumstances.

As he devoured his food far more rapidly than the female, and thus obtained an undue share, it was thought advisable to separate them at feeding-time. For this purpose a wooden partition fitting into a groove in the floor and fastened by upright supports was occasionally let down into the tank, projecting a few inches above the surface of the water. The female took no notice of this alteration, but invariably waited before commencing to feed until her mate was supplied on his side with a portion. The necessity for the separation soon became apparent; for the male cleared up every scrap of food long before the female, a more dainty and delicate feeder, had finished. He then became very restive, swimming actively around his straitened quarters, pressed his nose against the partition, rolled over on his back and exerted considerable force in his obstinate and repeated attempts to remove the obnoxious obstacle. Failing in his endeavours to push it on one side, he next tried to get over it, lifted his head above the water, feeling the edge of the partition with his fore paddles and raising them until they were almost level with the projecting edge. These efforts were repeated at intervals. The eyes were bright; and the whole bearing of the animal changed from a sluggish quiescence to intelligent activity. On one occasion, his keeper informed me, he actually succeeded in getting his fins over the edge, but was unable to make further progress.

The Manatees seem to repose naturally at the bottom, differing in this respect from the Porpoise, which, on ceasing to propel itself by active locomotion, inevitably floats to the surface of the water, the posture assumed during sleep. The positions adopted by the pair of Manatees under notice differ materially from those which were assumed by the female previously exhibited in Brighton, and by the much larger specimen, also a female, from the island of Trinidad, formerly on view at the Westminster Aquarium<sup>1</sup>; for both of these animals habitually poised themselves at an angle in a vertically inclined posture, with the body supported by the incurved tail-fin, the dorsal or upper surface of which

<sup>1</sup> See Dr. Murie, "Further Observations on the Manatee," Trans. Zool. Soc. vol. xi. p. 19.



was invariably turned under and applied to the floor. With the present pair a horizontal (and not incurved) position is habitual, and the body when resting on the ground is supported by the under surface of the caudal fin. In connection, however, with this difference of attitude, it may be noted that the previous specimens had both received some injury to one of the fore paddles, which may possibly have affected the balancing-power of the body, as well as the facility for upward respiratory movements, and thus have remotely influenced the posture adopted by them. During life the right fore paddle of the first Brighton female hung motionless to its side. After death it was apparent that the spine had received injury, that one of the arm-bones (the humerus) was shattered, and that reparative processes had commenced. This was a very youthful individual; for the bones were mere cartilage, and no vestiges of the transverse processes of the caudal vertebrae, so characteristic of the adult skeleton, were developed. This animal in life measured 3 feet 8½ inches; and the whole skeleton weighed only three pounds and a half. It is probable, therefore, that the incurved posture may be only adopted by injured and enfeebled animals, as facilitating aerial respiration. Neither of the pair under notice assumed it in health, the female making but a faint approach to it a few days before her death, after seven months' life in captivity. Then, and then only, her body became somewhat contracted, and the enfeebled creature supported herself on the edge of her tail-fin, and remained with her head always close to the surface of the water.

Lettuces and endives formed the favourite food of the pair, six dozen, weighing thirty pounds, being their average daily allowance. The male would devour at a pinch leaves of the cabbage, turnip, and carrot. Both relished those of the dandelion and the sow-thistle (*Sonchus oleraceus*). Some varieties of a common river-weed were also taken; but this food was abandoned on account of the leeches with which it was found to be infested. Sometimes the animals swim gently about and pursue the leaves floating on the water. At others the plants are seized in their mouths, drawn down and eaten under water, the hand-like fore fins being employed in separating the leaves. The food is invariably swallowed below the surface. The masticatory actions of the animal have been so fully and accurately described by Professor A. H. Garrod, F.R.S.<sup>1</sup>, that further remark on that subject is unnecessary. The habits of the animals in captivity, while affording occasional evidence of the ease and rapidity with which they move in the water, do not furnish much support to the views of their capability of habitual active progression on land. Yet it must be admitted that, supplied with a sufficiency of nicely varied food, they have no inducement to leave the water, and that the construction of their straight-walled tank precludes such efforts as a rule. The male, however, has recently been observed to make some slight attempts at terrestrial movement, turning himself round and progressing a few inches when his tank

<sup>1</sup> Trans. Zool. Soc. vol. x. p. 137.

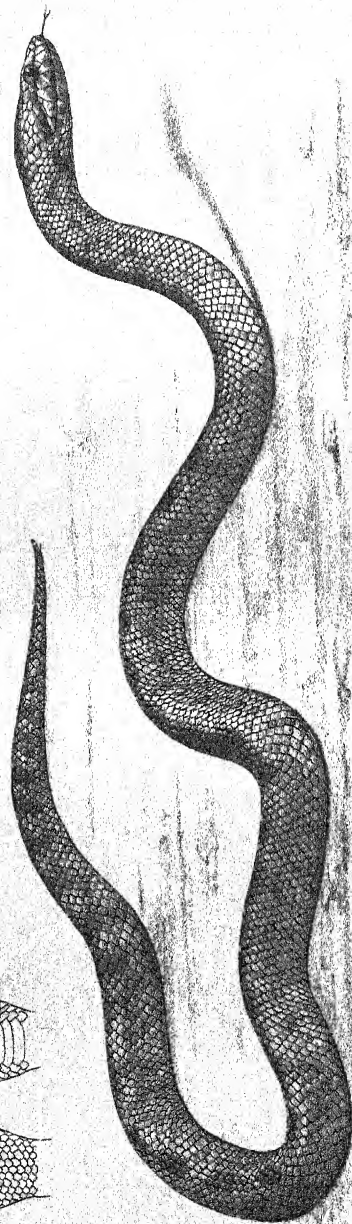
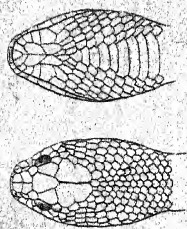
was empty. With jaws and tail-fin pressed closely to the ground, the body of the animal becomes arched, and is moved by a violent lateral effort, aided, and slightly supported, by the fore paddles, which are stretched out in a line with the mouth. But the effect of these very laboured efforts was not commensurate with their violence; in fact their relation to active locomotion may be compared to those of a man lying prone with fettered feet and elbows tied to side. Nor does the Manatee seem at all at ease out of water, as he lies apparently oppressed with his own bulk, while he invariably makes off to the deepest corner of his tank directly the water is readmitted. One point may be regarded as definitely settled. Notwithstanding the predilection they have evinced for land vegetables, they never feed out of water. Food has been repeatedly offered them; but it always remains untouched, although readily devoured when the influx of water set the leaves floating on the surface. Although it is possible that the animals can get out of water and remain so for a short period, as they progress so slowly and do not feed out of water, it seems as though they must be acquitted of the garden-depredations and prolonged wanderings from their native element with which they have been credited.

In the spring of the year 1880 the female Manatee died, after seven months' existence in the Aquarium. The history of the male in the subsequent interval may be epitomized in the words lie still and grow fat. He evinced no grief at the loss of his companion. His fifteen months' life in the institution may be taken as refuting a recent statement by a well-known naturalist in the columns of 'Land and Water,' that these animals "will not feed and cannot be kept in captivity." As his present length (Dec. 1880) is five feet two inches, and his maximum girth four feet ten inches, he has increased four inches in length and ten inches in bulk in the thirteen months that have elapsed between the two measurements. It is evident, therefore, that he thrives well on the sliced roots of swede turnips and carrots which have of late constituted his chief nourishment. Beyond these scanty facts, I have nothing further to record concerning the uneventful life-history in captivity of these silent and individually uninteresting animals.

In conclusion I would tender my best thanks to Mr. Thomas Davidson, F.R.S., for his kindness in furnishing me with a sketch from nature of the animal, and to Mr. A. Lawler, resident naturalist at the Aquarium, for information courteously afforded.

P.S.—The male died on February 8, 1881, having been seventeen months all but five days in the tank. It measured 5 feet 2 inches in length, having grown 4 inches during its captivity. It appears to have suffered from the exceptionally severe weather of the latter part of January; but the body, which was presented by the Directors to the Museum of the College of Surgeons, was in good condition, and showed no evidence of disease in any of the viscera.





R. Mardern del. et lith.

*DITYOPHIS VIVAX.*

Muscat. Bros., imp.

3. Descriptions of the Amphisbænians and Ophidians collected by Prof. I. Bayley Balfour in the Island of Socotra. By Dr. A. GÜNTHER, F.Z.S.

[Received March 7, 1881.]

(Plates XL., XLI.)

The Reptiles described in the present paper are of considerable interest. We might have expected, from the geographical position of Socotra, that the species would show a close affinity to, if not identity with, those of the nearest portion of the mainland of Africa; but in fact this affinity is overbalanced by that to the Arabian fauna, at least as far as the few species enumerated here are concerned. The most singular fact is that three out of the four species seem to be peculiar to the island, two being so much differentiated as to deserve generic distinction.

1. The *Amphisbæna* belongs to a distinct genus, the nearest allies of which inhabit Eastern and Western Tropical Africa.

2. The Coronelline Snake, *Ditypophis*, belongs to a distinct genus, apparently approaching the circum-Mediterranean *Tachymenis vivax*.

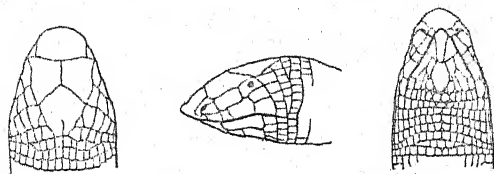
3. The Socotran species of the circum-Mediterranean or Central-Asiatic genus *Zamenis* is most nearly allied to the Arabian *Z. elegantissimus*.

4. Finally, the Viper of Socotra is identical with a species hitherto found in Arabia and on the shores of the Dead Sea.

#### A. AMPHISBÆNIDÆ.

##### PACHYCALAMUS, g. n.

Allied to *Baikia* and *Geocalamus*<sup>1</sup>. Head very short, with de-



Head-shields of *Pachycalamus brevis*.

pressed snout. Rostral large, with cutting anterior edge. Two large frontals form a suture together behind the rostral, and are succeeded by a single very large shield, which represents the vertical and occipitals. Nasal small, above the first and second labials, com-

<sup>1</sup> Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 234 (1880).

posed of two scutes ; nostril inferior ; præocular above the third and fourth labials ; a small ocular, with the eye very indistinct ; an infraocular between the ocular and fifth labial. Five upper labials. Temporals small, in two transverse series. Mentale much longer than broad ; three lower labials ; gulars small. No enlarged sternal scutes. Præanal scutes very narrow, elongate, in four pairs. Two pairs of præanal pores. Lateral line none. Extremity of the tail depressed.

*PACHYCALAMUS BREVIS*, sp. n.

One verticillus consists of 48 scutes. Upper parts slate-coloured, lower white.

This must be a common species, as many specimens were collected. One of the largest is  $7\frac{1}{3}$  inches long, the tail being  $\frac{1}{2}$  inch. Probably the species remains within these dimensions.

B. OPHIDIA.

1. *TYPHLOPS*, sp.

This specimen is young, and too small for identification.

*DITYOPHIS* (g. n. Coronellid.).

Body stout, rounded, covered with smooth scales. Head depressed, not very distinct from neck. Eye rather small, with vertical pupil. One loreal ; two anterior and two posterior oculars ; nasal undivided above, but divided below the nostril. Subcaudals undivided. Posterior maxillary tooth longest, grooved.

This Coronelline Snake is evidently allied to *Tachymenis*, but has several characters in common with *Dipsadoboa*. From the former it is distinguished by its entire subcaudal shields, from the latter by its much stouter habit.

2. *DITYOPHIS VIVAX*, sp. n. (Plate XL.)

At the first glance this Snake reminds us of *Tachymenis vivax*, especially with regard to the form of the head ; but it is still stouter than that species. The posterior and anterior frontals are subequal in size ; the superciliaries large, nearly the size of the vertical ; the occipitals as long as the vertical and posterior frontals together. The upper præocular is in contact with the vertical ; the lower is much smaller, and, in fact, a detached portion of the third upper labial. Temporals scale-like, 2+3 or 4. Eight upper labials, the fourth and fifth entering the orbit. Four lower labials in contact with the anterior chin-shields.

Scales in 21 series, those of the median series not differing in size from the others. Ventral shields 150 ; anal entire ; subcaudals 39.

The coloration is reddish sandy, with indistinct darker cloudy spots on the back ; lower parts whitish. In a dry sandy locality the colour of this Snake must so much assimilate to that of its surroundings as to render the animal nearly invisible.

A single specimen, 14 inches long, is in the collection; the tail measures 2 inches.

### 3. *ZAMENIS SOCOTRÆ*, sp. n. (Plate XLI.)

Habit slender; head narrow; eye of moderate size. Rostral shield convex, just reaching the upper surface of the head. The scutes of the upper surface of the head are not subdivided; anterior frontals much smaller than the posterior; vertical large, broad in front, with the lateral margins slightly concave; occipitals truncated behind; a triangular enlarged scale fits into the notch between their ends. Loreal elongate. Ten upper labials, of which the fourth and sixth are transversely divided, so that three præ- and three post-oculars may be distinguished; the fifth upper labial is undivided, and enters the orbit. The posterior chin-shields are extremely narrow, much narrower than the anterior, and are separated by several smaller narrow scutes. Temporals scale-like, 3+3+3. Scales smooth, in 23 rows. Ventrals 225; anal bifid; subcaudals 117. Abdomen with a very obscure ridge on each side.

The head is nearly uniform olive above; there is no spot below the eye, or temple-streak. The ground-colour of the anterior half of the body is pink, with olive cross bands edged with black and about as broad as the interspaces. Towards the middle of the body the pink interspaces become indistinct and mottled with short black lines; and the tail is nearly uniform olive. Lower parts uniform reddish white.

In a variety the black edges to the cross bands are absent, and the pink interspaces are, from the fore part of the trunk, mottled with olive.

Of this fine and very distinct species of *Zamenis* there are three specimens in the collection. The largest measures  $32\frac{1}{2}$  inches, the tail taking  $8\frac{1}{2}$  inches.

### 4. *ECHIS COLORATA*.

This species was characterized by me in the Society's 'Proceedings' 1878, p. 978, from a specimen obtained in Midian. It occurs also on the shores of the Dead Sea, two specimens obtained by Mr. Tristram, and formerly referred by me to *E. carinata*, belonging to it. One rather young example is in the Socotran collection, and of a more uniform coloration than the type. The characteristic of this species consists principally in the much smaller scales and scutes. It may be at once recognized by its very small nasals, which are separated by very small scutes from the rostral; whilst in *E. carinata* the large nasals form a suture with the rostral.

4. Notes on the Lizards collected in Socotra by Prof. I. Bayley Balfour. By W. T. BLANFORD, F.R.S., F.Z.S.

[Received April 1, 1881.]

(Plate XLII.)

The Lizards collected in Socotra by Dr. Balfour belong to six species, three of which appear to be undescribed. The species are *Chamæleon monachus*, *Hemidactylus homœolepis*, sp. nov., *Pristurus rupestris*, *P. insignis*, sp. nov., *Eremias (Mesalina) balfouri*, sp. nov., and *Euprepes perrotteti*, var. I add some remarks on these species, with descriptions of the new forms.

CHAMÆLEON MONACHUS, Gray, P. Z. S. 1864, p. 470, pl. xxxi.

Nine specimens brought. None are so large as the type, nor are the occipital lobes in any so much developed; but in all other details of structure the correspondence is exact.

The original type of this species in the British Museum was received from this Society in 1855, with the locality Madagascar. This locality, after the discovery of the same Lizard in Socotra, must be considered doubtful. Nothing is more probable than that Chamæleons, which live well in captivity, should be transported alive from one African island to another.

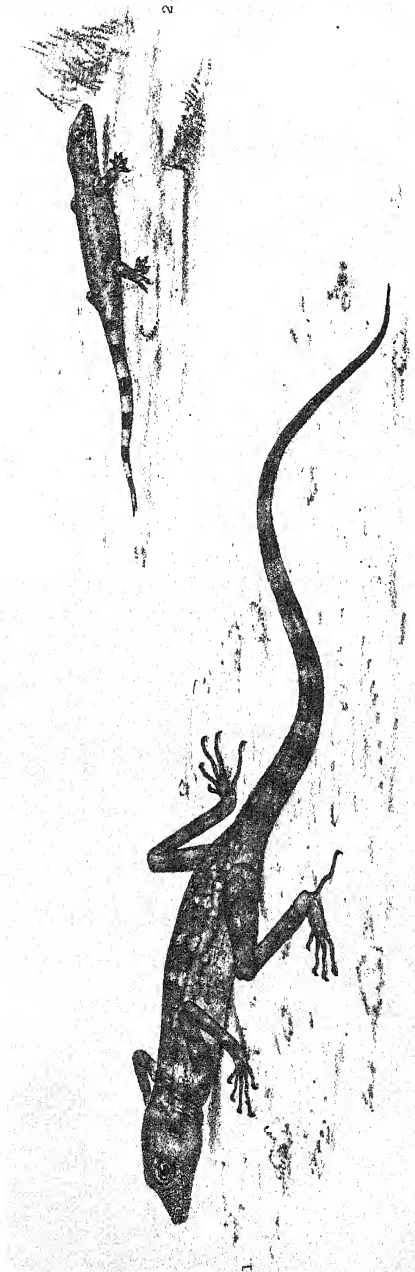
HEMIDACTYLUS (LIURUS) HOMŒOLEPIS, sp. nov. (Plate XLII. fig. 2.)

*H. parvus, squamis subæqualibus undique indutus, sine tuberculis majoribus; cauda rotundata, haud verticillata; unguibus minutis; poris inguinalibus paucis, femoralibus nullis; scutis supralabialibus 8, infralabialibus 7.*

Body and tail covered with small scales without any tubercles. Last joint of thumb present; all claws very minute, that of the thumb especially. Tail rounded, not verticillate. Four inguinal pores in the only male examined; they are arranged in a curve with the convexity directed forwards; no femoral pores. Eight upper and seven lower labials. Ear-orifice about the size of one of the hinder upper labials.

The flat rounded subgranular scales covering the trunk are subequal in size, but in the middle of the back they are rather smaller than on the sides. Those on the occiput are very small; on the nose they are rather larger and more convex. Scales of the abdomen small, no larger than those on the sides, and passing so gradually into the latter that it is impossible to count the number exactly; but there are more than 40 across the belly. Transverse lamellæ 5 or 6 beneath the thumb and first toe, 7 to 9 beneath the other digits, the proximal two or three on each digit being undivided. The scales above the tail and on its sides are about the same size as those on the back, and are arranged in not very distinct rings, each composed of a single row of scales; there is no division into segmental verticils as in most species of *Hemidactylus*. A row





R. Marden del. et lith.

1. PRISTURUS INSIGNIS  
2. HEMIDACTYLUS HOMOEOLEPIS

Marden. Proc. Zool.



of broad subcaudal shields begins some distance behind the anus, and is continued nearly to the tip of the tail.

Fig. 1.



Foot of *Hemidactylus homoeolepis*.

Colour above grey, rather irregularly spotted with black. Tail with about 7 transverse black bands, the last five extending all round and forming rings. Lower parts of head and body without dark marks.

Total length of the only perfect specimen 2·5 inches, from nose to anus 1·2. A larger specimen, apparently an adult male, measures 1·5 inch from nose to anus.

Two specimens only were obtained, one of which has a perfect tail. The nearest described form is probably *Liurus ornatus*<sup>1</sup> from Western Africa; but that is much larger, and has both enlarged tubercles on the back and femoral pores. *Hemidactylus homoeolepis* must be placed in the genus *Liurus*, if the latter be considered distinct.

#### PRISTURUS RUPESTRIS.

*Pristurus rupestris*, W. Blanf., Eastern Persia, ii. p. 350, pl. xxiii. fig. 1.

Several specimens. All agree with those from Muscat and the Persian Gulf, and differ from *P. flavipunctatus*, Rüpp., in wanting a rudimentary crest on the hinder part of the back, the row of enlarged and more or less spinose scales commencing on the upper surface of the tail just above the anus in *P. rupestris*, whereas it begins near the middle of the back in males, or a little farther back, above the pelvis, in females, as stated in Rüppell's original description<sup>2</sup>. The limbs and the toes too are considerably longer in *P. rupestris*, though still far inferior to those of *P. longipes*<sup>3</sup>. The latter species is found at Aden and Massowa, whilst *P. rupestris* occurs in Socotra, at Muscat in Arabia, and on the island of Kharg (Karrack) in the Persian Gulf, near Bushire. *P. flavipunctatus* was originally obtained from Massowa; and there are also specimens in the British Museum said to be from Syria.

In *P. longipes*, according to Peters, the length of the hind foot, including the longest toe, considerably exceeds that of the head, whilst in *P. flavipunctatus* the length of the hind foot equals the distance from the end of the snout to the ear-opening. There are typical specimens of *P. flavipunctatus* in the British Museum, received from Dr. Rüppell himself; and in these the length of the hind foot

<sup>1</sup> Gray, Cat. Lizards B. M. p. 157.

<sup>2</sup> Neue Wirbelthiere, Amphibien, p. 17.

<sup>3</sup> Peters, Monatsber. Akad. Wiss. Berlin, 1871, p. 506.

to the end of the third toe is less than the distance from the ear-opening to the end of the snout, whilst the two measurements are identical in *P. rupestris*. The proportions of the limbs to the body, however, in the British-Museum specimens of *P. flavipunctatus* agree with those assigned to the species by Peters.

The following measurements show, in parts of a metre, the differences in these species. The dimensions of *P. longipes* are those given by Peters; those of *P. rupestris* are from one of the largest Socotran specimens; those of *P. flavipunctatus*, from one of the specimens received from Rüppell.

	<i>P. longipes.</i>	<i>P. rupestris.</i>	<i>P. flavipunctatus.</i>
Head and body, from nose to anus ...	0·040	0·030	0·032
Head alone .....	0·009	0·009	0·009
Fore leg .....	0·021	0·015	0·013
Fore foot, to end of third finger .....	0·007	0·005	0·004
Hind leg .....	0·030	0·020	0·0175
Hind foot, to end of third toe .....	0·012	0·008	0·005

The specimens of *P. rupestris*, from Socotra, have for the most part a broad rufous band down the middle of the back. The sides of the back and the flanks are dark brown, spotted or striped with very light brown; there are one or two pale bands down the sides, and one conspicuous pale stripe below the eye, from the lower labials. The lower parts of the flanks and the sides of the belly have small brick-red spots dotted over them. This coloration differs in no important particular from that of Muscat and Persian-Gulf specimens.

**PRISTURUS INSIGNIS, sp. nov.** (Plate XLII. fig. 1.)

*P. major, gracilis, squamis minimis undique indutus; cauda compressa sed crista carente; pede posteriore antice adducto ante aurem jungente, anteriore ante extremitatem rostri. Long. tota 0·147 met., caudæ 0·095, capitis 0·014, pedis posterioris ab inguine 0·038.*

Much larger than the other species of the genus, and without any enlarged or spinose scales along the upper edge of the tail, which is elongate, attenuate, and compressed, as in the other forms, General form very slender; limbs and toes long, the fore limb laid back extends to the groin, and laid forwards extends beyond the snout by the length of the hand, the hind limb laid forwards reaches to beyond the ear.

Scales of the back and sides minute, granular, those of the belly scarcely larger, but less convex. Tail-scales larger than those of the back, and becoming imbricate behind; the upper edge of the tail sharply compressed, but without any enlarged scales, lower edge rounded, with a row of larger smooth imbricate subcaudals, the scales on each side of the subcaudals forming a passage in size into the ordinary tail-scales. Scales above the limbs like those on the back, those beneath the forearm and tarsus larger. Beneath the feet, the scales of the soles are small and granular, with the exception of rows of larger scales from the first and fifth fingers to the wrist, and from the first toe to the heel. The fingers and toes are

covered with smooth imbricate cross plates beneath. The fourth finger slightly exceeds the third; but the third toe is a little longer than the fourth.

Head short and high, the scales on the anterior upper portion in front of the eye slightly convex, considerably larger than those on the trunk, and nearly equal to those beneath the tarsus. Scales around the nostril very little larger than the others above the snout. Nostril in contact with the rostral, which is nearly twice as broad as the other supralabials, and grooved above in the middle. Supralabials on each side 6 to 9, the first 4 or 5 large, and those behind gradually diminishing in size. Three large lower labials in front on each side, and some small shields behind; median infralabial larger and broader than the rostral. Ear-opening large, about the size of the first upper labial.

Colour above earthy brown, with rather darker but indistinct cross bands and numerous red spots of irregular shape scattered over the back and sides; lower parts paler, chin, throat, and breast mottled with brown.

The following are the dimensions in inches:—

Total length .....	5·8
Length from nose to anus .....	2·1
Head from orifice of ear to snout .....	0·53
Fore limb to end of fingers .....	1·1
Hand from wrist to end of fourth finger .....	0·42
Hind limb to end of toes .....	1·5
Foot to end of third toe .....	0·52

Only two specimens of this fine species of Gecko have been procured.

EREMIAS (MESALINA) BALFOURI, sp. nov.

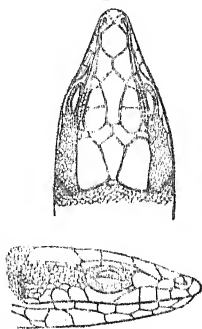
*E. ad E. pardalem affinis, parva, mediocriter gracilis, pede posteriore vix ante humerum attingente, scuto infraoculari ad labrum pertinente, supralabialibus 4 ante oculum; palpebra inferiore in medio translucente; regione supraorbitali ex duobus scutis majoribus composita, granulis duntaxat extus marginata; collari ex squamis majoribus composito, ad latera libero, medio adhærente; scutis ventralibus in 10 series longitudinales ordinatis, extremas multo minores, sex medias majores, subæquales; præanali magno; squamis dorsalibus rotundis, parvis, sine granis intervenientibus. Corpus superne longitudinaliter fasciatum, dorso medio pallide rufescente, lateribus fasciis alternantibus nigris pallidisque ornatis.*

General form rather stouter than that of *E. pardalis*, tail shorter, limbs shorter and stouter; the fore leg laid forward does not quite reach the end of the nose; the hind leg extends to the shoulder, or a little beyond. No palatal teeth. Lower eyelid with a translucent central disk more or less broken up into large plates; collar free at the sides, attached in the middle. Ventrals in longitudinal, not oblique rows. An enlarged præanal plate.

Nasal shields not very convex. The single præfrontal shield is not in contact with either the rostral or the vertical, being separated from the former by the upper nasals, and from the latter by the postfrontals. Superciliary disk nearly flat, and composed of two large

shields with a row of granules along the outer edge only, one or two small shields in front and behind. Central occipital well developed, about as broad as the vertical and as large as a præoccipital; a small

Fig. 2.

Head of *Eremias balfouri*.

posterior interoccipital. A large infraorbital shield, extending to the lip, with four supralabials on each side between it and the rostral. Ear-opening large, not toothed, but with an enlarged scale in front above; the scales of the temporal region are smooth, and slightly convex, those behind and below being larger than those in the middle and in front; the scales along the edge of the occipitals are variable. Usually 6 pairs of chin-shields, the first three pairs meeting in the centre, the fourth pair the largest.

Shields of the back granular, rounded, convex, without intervening granules; about 40 may be counted round the body, exclusive of the ventral shields. Scales of the tail arranged in rings and sharply keeled, except below, where they are smooth on the anterior half of the tail. There is a distinct fold beneath the throat connecting the ears. Collar nearly straight, generally of 7 or 8 large scales; but they often pass gradually into smaller scales on the sides. Ventrals in about 30 (from 27 to 31) transverse rows between the collar and the groin, and in ten longitudinal rows, the outer row on each side being not more than half the size of the next, which is inferior in size to each of the six median rows. Præanal shield as usual, rather variable in size, the scales around about equal in size to the ventrals. From 11 to 14 femoral pores on each thigh, the two series separated by a short interval in the præanal region.

Colour rather light rufous-brown on the middle portion of the back, bordered on each side by a narrow blackish band more or less broken up into spots, and then a pale rufescent grey band; below this, commencing from the eye and the upper part of the temple, is a broad blackish band on each side, speckled with white and mixed with rufous, especially in front; again, beneath this is a narrow light grey stripe from the upper labials through the eye and above the shoulder; and below this again there is sometimes a dusky band between the axils. The bands are gradually lost on the tail, the broad





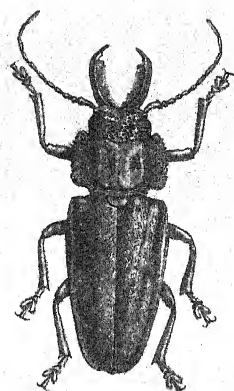
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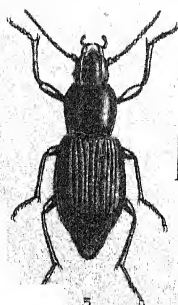
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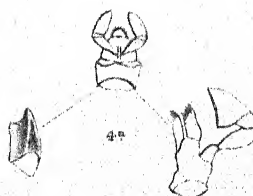
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4a



6.

atell.

Mintern Bros. imp.

COLEOPTERA FROM SOCOTRA.



dark lateral stripe continuing the furthest. Limbs spotted above. Lower parts white. The head above is greyish brown speckled with white.

In the largest individual, the length from nose to anus is 1·9 inch, head 0·48, fore limb 0·6, hind limb 1·15. The tail is imperfect. The only specimen with the tail nearly perfect is 4·5 inches long, of which the tail measures 2·75, and the body 1·75.

I know of no nearer ally to this Lizard than *E. (Mesalina) pardalis*<sup>1</sup>, which is a more elongate form, with longer limbs, smaller scales on the back, and of a totally different coloration.

Four specimens of this species have been obtained.

#### EUPREPES PERROTTETI, var.

There are four specimens of a Scinque with a transparent lower eyelid, the dorsal scales each with three strong keels, 31 to 32 scales round the body, and the back unstriped. I can find no sufficient character to separate this form from the Western-African *E. perrotteti*, of which a specimen was obtained by Mr. Jesse in Abyssinia (Geol. Zool. Abyss. p. 456).

In the Socotran Scinque, the postfrontals just meet; and in one example they are separate and the anterior point of the vertical shield is in contact with the rostral, whereas in *E. perrotteti* from Western Africa, as a rule, the postfrontals form a broad suture together, and completely isolate the vertical from the præfrontal. But there is much variation, and I find one specimen at least of *E. perrotteti*, from Senegal, with the postfrontals separate. Also the lobules in front of the ear are in general more elongate and pointed in the Socotran variety; but they are very variable.

The coloration of the Socotran examples is uniform dull olive on the back, upper part of limbs, and tail, rufous-brown on the head, and white below. The largest specimen measures 8½ inches, of which the tail is nearly 5.

*E. isseli* (Peters, Monatsber. Akad. Berlin, 1871, p. 567), from Northern Abyssinia (Bogos), must be closely allied, but differs in colour, being striped along the side, and in having a single præoccipital shield instead of two.

5. On the Coleopterous Insects collected by Prof. I. Bailey Balfour in the island of Socotra. By CHARLES O. WATERHOUSE. Communicated by Dr. GÜNTHER, F.R.S.

[Received March 30, 1881.]

(Plate XLIII.)

Although the number of species of Beetles collected by Prof. Balfour in Socotra is only twenty-four, there is enough to show, what one would naturally have expected, that the fauna is distinctly African.

<sup>1</sup> I am unable to distinguish between this form and *E. guttulata*, as I am not sure that the differences shown in Lichtenstein's, Duméril and Bibron's, and Gray's descriptions are constant.

Twelve species appear to be undescribed; and some of these may belong exclusively to the island; but our present knowledge of the Coleoptera of the neighbouring continents is not sufficient to enable us to speak with any degree of certainty on this point. Of the previously known species, five have a wide distribution, being found in Southern Europe and in most parts of Africa: these are *Hyphydrus guineensis*, Aubé, *Cybister africanus*, Laporte, *Dineutes æreus*, Klug, *Temnopterus spinipennis*, Guérin, and *Epilachna chrysomelina*, Ol. Two species, *Ateuchus sacer*, Linn., and *Ocnerna setosa*, Ménétrés, are chiefly found in Southern Europe, Asia Minor, and Egypt; *Oxythyrea helenæ*, Schaum, *Julodis clouei*, Buquet, and *Histeromorphus plicatus*, Kz., occur in Abyssinia; lastly, *Dermestes vulpinus*, Fabr., is cosmopolitan.

The following is a list of the species obtained:—

#### GEODEPHAGA.

*Tetragonoderus flavovittatus*, n. sp.

#### HYDRADEPHAGA.

*Hyphydrus guineensis*, Aubé.      *Dineutes æreus*, Klug.

*Cybister africanus*, Laporte.

#### PALPICORNIA.

*Temnopterus spinipennis*, Guérin.

#### NECROPHAGA.

*Dermestes vulpinus*, Fabr.

#### LAMELLICORNIA.

*Ateuchus sacer*, Linn.      *Oxythyrea helenæ*, Schaum.

*Pachydema puncticeps*, n. sp.

#### SERRICORNIA.

*Julodis clouei*, Buquet.

#### MALACODERMATA.

*Apate nitidipennis*, n. sp.

#### HETEROMERA.

*Zophosis æqualis*, n. sp.

*Histeromorphus plicatus*,

Kraatz.

— *plicatipennis*, n. sp.

*Eusyntelia* (n. g.) *balfouri*,  
n. sp.

*Eusyntelia* (n. g.) *ebenina*, n. sp.

— *glabra*, n. sp.

*Adelostoma bicarinatum*, n. sp.

*Ocnerna setosa*, Ménétrés.

*Opatrum costiferum*, n. sp.

*Apithesis* (n. g.) *obesus*, n. sp.

#### RHYNCHOPHORA.

*Piazomias vermiculosus*, n. sp.

#### LONGICORNIA.

*Mallodon arabicus*, Buquet.

#### PSEUDOTRIMERA.

*Epilachna chrysomelina*, var. *reticulata*, Oliv.

The following are descriptions of the new species :—

1. *TETRAGONODERUS FLAVOVITTATUS*, n. sp.

*Niger, nitidus; antennis pedibusque piceis, thorace nitido lævi, elytris ænescentibus plagis duabus flavis.*

Long.  $3\frac{1}{2}$  lin.

Very close to *T. quadrum*, Oliv., and of the same form and appearance. The head and thorax, however, are black (with the mandibles and the margins of the thorax slightly tinted with pitchy), very smooth, and shining. The eyes are protected posteriorly by the head partly surrounding them there. The thorax has the median channel well marked; and in the middle of the basal margin there are some longitudinal striæ. The elytra are slightly æneous, shining, with the striæ well marked, the fourth and fifth striæ rather distinctly punctured in their basal half; the interstices are nearly flat; the yellow markings resemble those of *T. quadrum*, but consist of two patches on each elytron, the basal one occupying the fourth, fifth, and sixth interstices, the second one forming an undulating fascia commencing on the third interstice and reaching to the eighth; that portion of it which is on the fifth interstice is more removed from the apex, and nearly joins the other patch on the fourth interstice. The legs and antennæ are pale pitchy, the femora dark in their middle.

2. *PACHYDEMA PUNCTICEPS*, n. sp.

*Oblonga, convexa, nitida, pallide castanea; capite piceo, crebre punctato; clypeo reflexo, parce punctato; thorace læve subtiliter punctato, medio longitudinaliter impresso; elytris læve punctulatis, lineis quatuor lævibus.*

Long. 10 lin.

Very robust, convex, a little flattened on the back of the elytra, subparallel at the sides. The head is rather strongly and very thickly punctured, the punctures crowded near the eyes; the clypeus is concave above, sparingly punctured, very slightly sinuate in the middle of the front margin, the margins reflexed. Thorax castaneous, one third broader than long, not very closely punctured, the punctuation more distinct above than at the sides; obliquely narrowed in front of the middle, subparallel behind the middle (viewed from above), with a very slight sinuosity, finely margined and fringed with long fulvous hairs; the posterior angles, viewed from above, appear little greater than right angles (slightly rounded), but when viewed laterally they are completely rounded off; the base is very slightly oblique on each side. Scutellum sparingly punctured on each side. Elytra much paler in colour than the thorax; at the base a very little broader than the thorax, a little wider in the middle, obtusely rounded at the apex; finely ciliated on the margins; moderately finely and not very closely punctured; each elytron has four fine, narrow smooth lines (included between lines of close very fine punctures), the first one very slightly raised. The pygidium is very delicately and rather thickly punctured. The club of the antennæ is fuscous testaceous, not very long. The tarsi are very

long; the anterior have the second, third, and fourth joints moderately dilated; the intermediate pair are only slightly so.

3. *APATE NITIDIPENNIS*, n. sp.

*Statura fere A. terebrantis, at duplo minor, nigra, elytris piceis, nitidis, punctis crebre aspera.*

Long.  $7\frac{1}{2}$  lin.

Forehead clothed with fulvous pile to rather above the middle of the eyes; without tubercles; the vertex finely and closely granular, with a fine smooth median line, the sides of the neck closely longitudinally rugulose. The labrum is very closely and extremely finely punctured. Clypeus moderately emarginate. Antennæ pitchy, the club clear fulvous. Thorax scarcely narrower than the elytra, a trifle broader than long; the basal half closely covered with small depressed granules; the front is covered with small tubercles with rather larger ones intermixed, these latter becoming more prominent and acute towards the anterior angles; one at the anterior angles becomes a strong deflexed, recurved tooth, close to the margin. The elytra are  $2\frac{1}{4}$  times as long as the thorax, a very little wider near the apex than at the base; the surface even and shining; the punctures are clear and distinct (distant from each other about twice the diameter of the larger punctures), they are fine at the base, and gradually become stronger and a little larger towards the apex, but they are very fine at the sides; in the apical declivity the punctures are very strong; on the back there are two pairs of lines of punctures on each elytron, indicating the dorsal costæ frequently seen in this genus; the spaces between them are not at all raised, except at the apical declivity, where they are very slightly inflated, but scarcely projecting; the incrassated apical margin is closely and finely punctured. The underside is obscure pitchy, clothed with fine yellowish pubescence. The legs are also pitchy; the whole of the inner side of anterior tibiæ is clothed with very pale fulvous pile; on the outer edge are three or four very small teeth. The intermediate tibiæ have on their outer edge four or five very small sharp teeth; the posterior tibiæ are smooth. The abdomen is opaque, very closely and extremely finely punctured.

A single example, apparently a female.

In the Museum collection there is a specimen from East Africa which differs from the above in having the elytra a little shorter, the punctuation on them rather stronger, with two fine dorsal costæ, and with an indication of a third more lateral one; the tibiæ have more teeth on their outer edge, and the posterior pair have also a few fine teeth; the abdomen is less closely punctured; the labrum is less closely punctured; the clypeus deeply emarginate, &c. I have no name for this species, and only mention it that it may not be confounded with that from Socotra.

Both these species appear to be nearly allied to *A. cornifrons*, Bandi de Selve (Berl. ent. Zeit. 1874, xxviii. p. 834); but that species is described as being somewhat pubescent, and the forehead of the female has a longitudinal channel and a fovea on the vertex.

The fine frontal line in my species can scarcely be described as a channel; and there is no fovea on the vertex.

4. *ZOPHOSIS ÆQUALIS*, n. sp.

*Statura fere Z. orientalis*, Deyr., *at minus convexa, magis parallelâ, æneo-nigra, parum nitida; thorace creberrime et subtilissime punctulato; elytris sat crebre subtilissime punctulatis.*

Long. 3 lin.

Oblong-ovate, not very convex; slightly tinted with æneous. Head convex, densely and very finely punctured; labrum not very closely but extremely delicately punctured. Thorax evenly convex, deflexed at the sides, finely margined anteriorly, twice as broad as long, arcuately narrowed anteriorly, very closely and extremely delicately punctured. Elytra as broad as the base of the thorax, nearly straight at the sides, arcuately narrowed at the apex, moderately convex; the punctuation is extremely fine, but rather more distinct than on the thorax, and decidedly less close; on the margin, near the apex, some of the punctures are longitudinally asperate; the epipleural line is completely marginal; the epipleuron has a few short longitudinal impressed lines. The antennæ are black; the second and fourth joints are nearly equal, both a trifle shorter than the third. The spurs on the tibiæ are reddish. The prosternal process is elongate-ovate, moderately broad, finely margined, extremely delicately, and not very thickly punctulate.

Some of the specimens have the epistoma separated from the forehead by a fine sinuous line, in the middle of which is a shallow fovea; the epistoma is more strongly punctured; and the elytra have more asperate punctures along the whole margins. I take these to be merely varieties, as they vary somewhat among themselves.

This species appears, from M. Deyrolle's monograph, to be nearly allied to *Z. elongata*, Deyr. (Ann. Soc. Ent. Fr. 1867, vii. p. 219); but that species has evidently much more asperate punctuation on the sides of the elytra, &c.

5. *HISTEROMORPHUS PLICATIPENNIS*, n. sp. (Plate XLIII. fig. 1.)

*Niger, nitidus; capite thoraceque lævibus, elytris singulatim lineis quatuor longitudinalibus angulatis impressis, interstitiis 2., 3. et 4. bene convexis angulatim flexuosis.*

Long. 4 lin.

This species is much smaller than *H. plicatus*, Kz., but has almost precisely the same form. It is at once distinguished by the remarkable plicate elytra. Each elytron has four zigzag striæ (besides a portion of a fifth on the side); the space between the first and second striæ is only slightly convex; the three following interstices are very convex and are zigzag in the same way as the striæ, impunctate; the apex of the elytra is flattened above, but scarcely reflexed.

*EUSYNTELIA*, n. gen.

Mesosternum sloping, more or less concave. Eyes subreniform,  
PROC. ZOO. SOC.—1881, No. XXXI.

not divided by a lamina, not prominent laterally. Head below with a deep transverse impression, above with a ridge over each eye. Epistoma with a somewhat acute projection in the middle of the front margin, the labrum distinctly visible from above. Antennæ with the third joint scarcely twice as long as the second. Body not very convex, not pubescent. Thorax as broad or rather broader than long, the sides gently arcuate. The elytra with distinct shoulders, about one third longer than the head and thorax together, margined at the base, somewhat produced at the apex.

The species upon which I establish this genus very much resembles *Thalpophila abbreviata*, Fabr., in form, but is shining black or without pubescence. It has, however, the gular line transverse and not oblique at the sides, as in *Thalpophila*. I propose to place it before *Tentyria* (following Dr. Kraatz in classification), so that it may come in proximity to those genera which have the labrum exposed.

The second species closely resembles the first, but has the throat more approaching that of *Anatolica*.

The third species somewhat resembles a species of *Dichomma*.

6. *EUSYNTELIA BALFOURI*, n. sp. (Plate XLIII. fig. 5.)

*Nigra, nitida; capite crebre subtiliter punctulato lineisque nonnullis longitudinalibus impresso; thorace lævi, latera versus subtiliter sat crebre punctulato; elytris fortiter sulcatis, interstitiis sat convexis, subtilissime disperse punctulatis.*

Long.  $6\frac{1}{2}$ – $8\frac{1}{2}$  lin.

Head finely or moderately thickly punctured, with several irregular longitudinal impressed lines on the forehead, deeply impressed within the ocular ridge; the clypeus produced in the middle into a point, which is slightly bent down at the apex. Eyes not much convex, slightly reniform, the upper part the larger, not so prominent as the head in front of the eye, supported posteriorly by a swelling of the neck. Thorax not quite twice as broad as the head, about one fifth broader than long, only gently convex; finely margined all round, except in the middle of the anterior margin; arcuately emarginate in front, slightly narrowed in front and behind; the anterior angles blunt; the sides gently arcuate; the posterior angles a little greater than right angles and blunt; the base scarcely sinuate on each side, gently lobed in the middle. Scutellum small. Elytra at their base not broader than the base of the thorax, and fitting close to it, gradually and slightly widening to the middle, and then again narrowed to the apex, not very convex, rather depressed on the back; rather strongly and obtusely sulcate, the interstices rather convex, extremely delicately and not very closely punctured; the apex somewhat produced and impressed above. Antennæ as long as the head and half the thorax. Posterior tibiæ closely and rather strongly punctured on their upper edge, the punctures almost asperate.

7. *EUSYNTELIA EBENINA*, n. sp.

*Nigra, nitida; capite subtiliter punctulato, thorace fere lævi,*

*postice parum angustato, lateribus post medium fere rectis; elytris sulcatis, fere lævibus.*

Long.  $7\frac{1}{2}$  lin.

This species is very close to the preceding, but is at once distinguished by the thorax being rather narrower, more convex in front, rather more narrowed behind, and the sides, instead of being regularly arcuate, are somewhat rectilinear behind the middle. The antennæ are rather longer. The head is more delicately punctured; and there are no longitudinal impressed lines on the forehead. The thorax is almost entirely smooth, a few excessively fine punctures being visible near the posterior angles. The punctures on the posterior tibiæ are finer, and distinctly separated from each other.

This species so closely resembles *S. balfouri* in all its general characters and appearance, that it occurred to me that the differences might, perhaps, be sexual; this, however, I have, by dissection, proved not to be the case.

8. *EUSYNTELIA GLABRA*, n. sp. (Plate XLIII. fig. 6.)

*Nigra, nitida, convexiuscula; capite crebre evidenter punctulato, thorace creberrime subtiliter punctulato; elytris striis obtusis perparum impressis, interstitiis parum convexis, fere lævibus.*

Long.  $5\frac{1}{2}$  lin.

Elongate-ovate, moderately convex, glabrous. Antennæ moderately short, shining, not very thickly but very finely punctured. Head moderately thickly and very distinctly punctured; the ocular ridge moderately strong; the projection in the middle of the margin of the clypeus rather small and acute. Thorax nearly twice as broad as the head, about one fifth broader than long, a very little more narrowed in front than behind, gently convex; finely margined all round (except, perhaps, in the middle of the anterior margin); very finely and rather closely punctured and evenly so all over; the anterior angles moderately prominent; the sides moderately and perfectly evenly arcuate; the posterior angles are rather greater than right angles (about  $120^\circ$ ); the base is broadly and gently lobed in the middle. Elytra about one quarter longer than the head and thorax together, rather convex, a little flatter on the back; at the base a very little broader than the base of the thorax, gradually and evenly enlarged to the middle (where their width is equal to the length of the head and thorax together), then narrowed again to the apex, which is very slightly produced; each elytron has four or five rather obscure impressed channels (obsolete at the base); the second, third, and fourth interstices are very gently convex; the punctuation, although not sparse, is very fine and obscure, and in parts scarcely visible.

9. *ADELSTOMA BICARINATUM*, n. sp. (Plate XLIII. fig. 3.)

*Subparallelum, depressum, griseo-nigrum, opacum, rugosum; thorace dorso carinis duabus distantibus; elytris singulis costis tribus, carina secunda basi apiceque abbreviata.*

Long.  $2\frac{1}{2}$  lin.

A short, broad species. Head closely and rugosely punctured, scarcely impressed on each side above, slightly broader posteriorly than in front, nearly straight-sided; the median carina is fine, and is continued back to the vertex; the ocular carina is very short. Thorax very closely and rugosely punctured, at the anterior angles very slightly broader than the head, much broader behind the middle, narrowed again at the base, gently reflexed at the sides, with two strong dorsal costæ; the anterior angles, although not very acute, are decidedly prominent; the sides are strongly angular considerably behind the middle; the base is divided into three equal parts by the points of juncture with the dorsal carinæ. Elytra one quarter longer than broad, depressed, rather suddenly deflexed at the apex; each elytron with three well-marked costæ, the second distinctly abbreviated at the base and apex; the first interstice with two lines, the second and third with three lines of strong deep punctures. Legs obscure pitchy.

10. *OPATRUM COSTIFERUM*, n. sp. (Plate XLIII. fig. 2.)

*Breviter oblongum, convexum, latum, nigro-piceum, supra sabulosolutosum; elytris costatis, costis tuberculatis.*

Long. 6 lin., lat. 4 lin.

Head covered with small, round, shining, black granules placed moderately close together. The clypeus has its front margin straight on each side of the deep triangular incision; at the sides it is suddenly obliquely turned back, so as to form an obtuse angle with the antennal orbits. The third joint of the antennæ is at least as long as the three following joints together; the fourth joint is a trifle longer than broad, the fifth to eighth are nearly globular; the ninth and tenth are distinctly transverse, and a little broader than the eighth; the eleventh is nearly globular, scarcely narrower than the tenth. The thorax is twice as broad as its length in the middle, deeply emarginate in front for the reception of the head, convex on the disk, impressed at the sides, arcuately narrowed in front of the middle; the anterior angles are blunted right angles; the sides behind the middle are parallel; the posterior angles are blunt, and a little greater than right angles; the base is broadly lobed in the middle, the lobe itself straight next the scutellum; all the disk rather closely covered with depressed conical black tubercles; there is a fine median impressed line. Elytra at the base scarcely broader than the thorax, a trifle broader at the middle, scarcely longer than broad, very convex, descending at the apex, very gently arcuate at the sides; each elytron has seven slightly raised broad tectiform costæ, a line of small round obtuse tubercles being ranged along the summit of each costa. Tarsi short and thick.

This species has somewhat the appearance of *Saragus lævicollis*, Oliv., and at first sight would scarcely be taken for an *Opatrum*.

*APITHESIS*, n. gen.

Mentum transversely trapeziform, narrowest at the base; labial palpi short and thick, the apical joint large, thick at the base, narrowed



towards the apex. Inner lobe of the maxilla terminating in a horny hook; the palpi moderately large, the apical joint strongly securiform. The mandibles emarginate at their apex. Labrum transverse, projecting and exposed, entire. Head imbedded in the thorax as far as the eyes: the epistoma separated from the forehead on each side by a fine line, the front margin emarginate. Eyes moderately transverse, the canthus half dividing them; the upper and lower parts nearly equal. Antennæ rather short; the second joint a little longer than broad; the third twice as long as the second; the fourth a little longer than the second; the fifth and sixth shorter; the seventh as long as broad, very narrow at its base, very broad at the apex; the eighth nearly an equilateral triangle; the ninth and tenth very transversely cup-shaped; the eleventh nearly as broad as the tenth joint, flat, somewhat circular in outline. Thorax as in *Alphitobius*, but more convex and with the lateral margins slightly impressed. Elytra very convex, very little broader than the thorax, very little longer than broad, descending at the apex, strongly striated, the epipleural fold rather broad at the base, gradually narrowed posteriorly, terminating suddenly a little way from the apex. Legs slightly rough and finely pubescent; the tarsi clothed beneath with close fine hair; the anterior tibiæ more linear than in *Alphitobius*. Anterior coxæ slightly transverse. Prosternum arched between the coxæ, very slightly produced posteriorly. Mesosternum sloping and gently concave. Metasternum short. Body above not pubescent. Wings none.

I have great difficulty in placing this genus; but, on the whole, it seems best arranged near *Alphitobius*, although its broader and convex form give it a different appearance; the tibiæ are more linear than in that genus, and the whole legs more punctured and pubescent. The under flanks of the thorax are concave as in *Crypticus quisquilius*, but it has not the long slender legs as in that insect. It is apterous; a character which is hitherto foreign to the *Ulominæ*, but which I do not consider a fatal bar to its being placed in that subfamily.

11. APITHESIS OBESA, n. sp. (Plate XLIII. fig. 4.)

*Breviter oblongo-ovata, convexa, nigro-picea, sat opaca; thorace crebre punctulato, basi marginato, utrinque linea brevi juxta basin et ad eam parallela, elytris thorace paulo latioribus sicut inflatis, fortiter striatis, interstitiis crebre subtiliter punctulatis.*

Long.  $3\frac{1}{2}$  lin.

Head closely and rather strongly punctured; clypeus very closely and more finely punctured, oblique at the sides, emarginate in front, the margin pitchy. Thorax convex, twice as broad as its length in the middle, gradually arcuately narrowed from the base to the front; moderately thickly, evenly, finely, but distinctly punctured; the sides narrowly impressed above, very delicately margined; the posterior angles slightly acute; the base rather strongly sinuate on each side, finely margined; on each side, almost on the margin, is an abbreviated impressed line, particularly visible when viewed from behind. Elytra at the base as broad as the thorax, a little wider

posteriorly, where they are more convex, declivous at the apex; each elytron has eight rather strongly impressed, finely and closely punctured striæ, the fourth and fifth much shorter than the others, and united posteriorly; the interstices are slightly convex, opaque, finely and rather thickly punctured.

12. *PIAZOMIAS VERMICULOSUS*, n. sp.

*Nigro-fuscus, squamis griseo-sabulosis dense vestitus; rostro trisulcato; thorace vermiculoso, lateribus bene rotundatis, basi marginata; elytris fortiter striatis.*

Long. 6-7 $\frac{1}{4}$  lin.

This species has much the form and general appearance of *Herpystichus eremita*. Rostrum nearly parallel, flattened above, longitudinally rugulose; with a fine impressed median line reaching nearly to the vertex; and on each side there is a longitudinal impression. The eyes are moderately prominent, rather less than a semicircle viewed from above. Thorax a trifle broader than long, trifurcate in front and behind, moderately rounded at the sides, broadest rather behind the middle, slightly depressed on the disk, with a well-marked median channel which does not reach the front margin; all the surface (except the anterior border) vermiculose, and divided into rather irregular round areas, which have generally one puncture about the middle; the disk is covered with pale scales; and there are some very pale scales at the sides; the base is margined. Scutellum very small, shining black. Elytra at the margined base a very little wider than the base of the thorax, but immediately becoming wider (without, however, making any distinct shoulders), oblong-ovate, convex, sloping down and somewhat acuminate at the apex, strongly striated, the striæ strongly but not closely punctured; the interstices almost flat, covered with sandy grey scales, with small dots of a paler colour at intervals on the striæ; the scales on the margins of the elytra and on a spot on the hinder femora are also paler. Tarsi grey.

*MALLODON ARABICUS*. (Plate XLIII. fig. 7.)

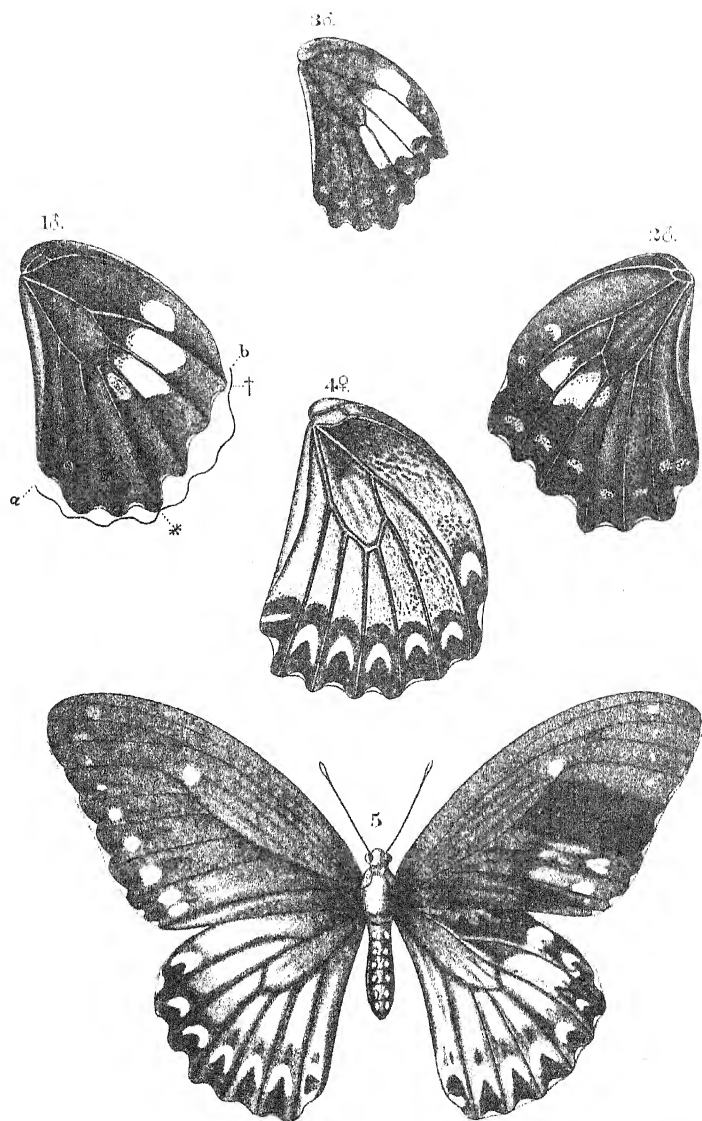
*Mallodon arabicus*, Buquet, Rev. Zool. 1843, p. 330 (?).

Two examples brought by Prof. Balfour appear to be referable to this species; they are, however, smaller than the size given for the Arabian specimen, being only 22 lines in length; and there are one or two other points in the description that leave room for doubt. The Socotran examples have the head densely and strongly rugose; the thorax has the anterior angles very much advanced, but rounded at their apex; the sides are much flattened, so as to be below the level of the disk, and, although opaque, the flattened parts are not very rugosely sculptured.

EXPLANATION OF PLATE XLIII.

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| Fig. 1. <i>Histeromorphus plicatipennis</i> , 473. | Fig. 4. <i>Apithesis obesa</i> , p. 477. |
| 2. <i>Opatrum costiferum</i> , p. 476.             | 5. <i>Eusyntelia balfouri</i> , p. 474.  |
| 3. <i>Adelostoma bicarinatum</i> , p. 475.         | 6. — <i>glabra</i> , p. 475.             |
|  | 7. <i>Mallodon arabicus</i> , p. 478.    |



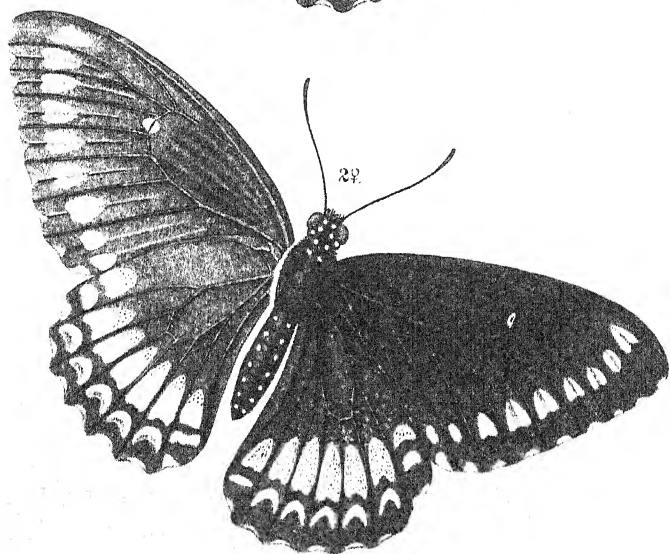
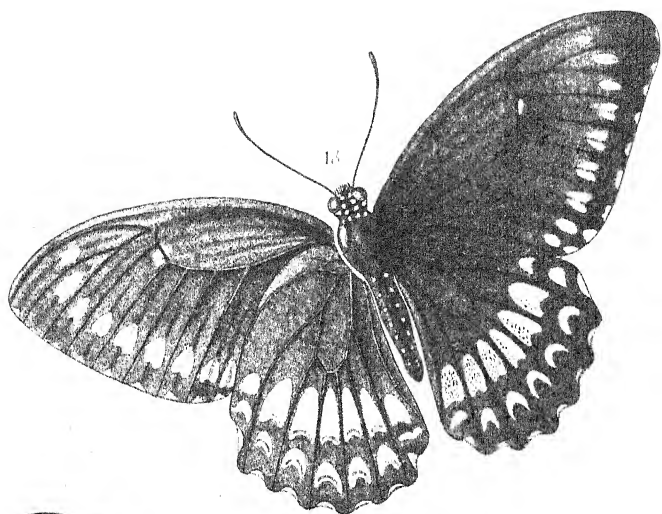


del W. Purkiss lith

Hamb

Fig. 12.3 PAPILIO CASTOR. Fig. 4 P. POLLUX.  
5 P. POLLUX. (*Cynandromorphous ind.*)





♂ del W. Parkins lith

Herb. h. m. y.

PAPILIO POLLUX (var. DRAVIDARUM)

6. Observations on two Species of Indian Butterflies (*Papilio castor* and *P. pollux*). By J. O. WESTWOOD, M.A., F.L.S., &c.

[Received February 12, 1881.]

(Plates XLIV., XLV.)

In the 80th plate of my 'Arcana Entomologica,' published 1st September, 1844, I represented, under the names of *Papilio castor* and *P. pollux*, two theretofore unfigured and undescribed Butterflies, which I regarded as distinct species, sent from Assam and Sylhet by the Rev. J. Staniforth and Major F. Jenkins.

The first of these two Butterflies, *P. castor*, of which males only had been sent, is of a dark brown or nearly black colour on the upper surface of the wings, the anterior pair having no other marking on this side than very small white marks on the outer margin between the extremities of the longitudinal veins, growing gradually smaller and even obsolete from the middle of this margin to the apex of the wing; on the upper surface of the hind wings there is a large, very pale yellowish-white patch near the outer angle, divided by the longitudinal veins into four spots (Plate XLIV. fig. 1, upperside of the hind wing). On the underside the fore wings have a very small white spot at the extremity of the discoidal cell; the minute white marginal spots described above are present, and are preceded by a row of very minute white spots close to the outer margin of the wing, and which diminish in size and become obsolete towards the apex in the same manner as the marginal dots. The hind wings on the underside have the four large spots towards the outer angle of a diminished size, the first and fourth being very small. The small white marginal incisures are preceded by a submarginal row of very small white spots, of which the middle ones are almost obliterated, whilst the one at the anal angle is duplicated (Plate XLIV. fig. 2 represents the underside of the hind wing). In some specimens the submarginal row of white spots on the hind wings are more decided and larger than in others. It is to be added that the hind wings are elongate-ovate, produced more decidedly at the extremity of the third branch of the median vein, which is, in the regularly tailed species, developed into the spatulate tail. The head and neck are dotted with white; and there are two rows of white dots on the upper surface of the abdominal segments.

These male insects vary considerably in size: the expanse of the more normal individuals is  $4\frac{1}{8}$  inches; but specimens before me vary from  $3\frac{1}{3}$  to  $4\frac{2}{3}$  inches. Plate XLIV. fig. 3 represents the upperside of the hind wing of the smallest individual, of the natural size; the large white discoidal spot is comparatively larger than usual; and there are very slight traces to be observed of a row of submarginal white spots represented by a few scales. It is from Sylhet.

The second of my supposed species (*P. pollux*) was figured from

a female specimen (of which sex many more specimens have been obtained) having the upperside of the wings dark brown, with a small whitish dot at the extremity of the discoidal cell of the fore wings, and a row of small submarginal white spots (of different sizes) parallel to the outer margin of the fore wing, which is marked with slight marginal white incisions. The hind wings on the upperside have a broad fascia of dirty greenish-white colour, strongly irrorated with blackish scales, extending all across the middle of the wing and into the discoidal cell, and divided by the longitudinal veins into seven longitudinal patches; the outer margin of this fascia is scalloped, and is followed by a submarginal row of seven large white lunules, the one next the anal angle being divided in the middle, and with very slight marginal white incisures between the veins. On the underside the pale-coloured portion of the hind wings (Plate XLIV. fig. 4) extends much further towards the base of the wings, and is also partially seen on the inner portion of the fore wings; the submarginal lunules are also larger. Various specimens of this female varied from  $4\frac{3}{4}$  to  $5\frac{1}{2}$  inches in expanse. It is to be further noticed that the hind wings are rounded in form, with the hind margins slightly scalloped.

From the preceding observations it will be seen that, in addition to the different dimensions, *P. castor* is distinguished by the large, nearly white 4-partite spot between the outer angle and the disk of the hind wings, which are elongate-ovate in form; whilst *P. pollux* has rounded hind wings, nearly the whole of the disk of which bears a broad 7-partite band of strongly irrorated greenish-white colour, separated by the veins, and gradually shaded off into the dark base of the wings, and with a submarginal row of whitish lunules.

In the extensive genus *Papilio* there is great diversity in the extent of difference between the two sexes of the same species. Thus, whilst in some (*P. machaon*, *P. podalirius*, &c.) it is almost impossible, without microscopical examination, to distinguish the male from the female, other species differ so greatly in size, shape, colour, and markings as to lead to the opposite sexes being easily mistaken (as, indeed, in many instances has been the case) for distinct species. The decided determination of this question is, of course, only to be obtained by an examination of the insects in nature, either by observing their actual sexual connexion, or by rearing the two sexes from the same batch of eggs. Beyond this, of course, the assertion of the sexual connexion between two dissimilar insects must of course be conjectural; and conjecture has been at work with the two insects under consideration.

The late Mr. E. Doubleday introduced these insects as two distinct species in his portion of the 'Genera of Diurnal Lepidoptera,' *P. castor* being his 72nd species (p. 12), placed between *P. erithonius*, Cramer, and *P. phestus*, Bdv. & Guérin, 'Voy. Coquille, Ins.' pl. 14. f. 2 (to which latter it bears considerable resemblance in form); whilst *P. pollux* is his 264th species, placed between *P. dissimilis*, Linn. (*P. panope*, Linn., ♀), and *P. palephales*, Westw. 'Arc. Ent.' t. 79. f. 1, 2, from Manilla.



By the late Mr. G. R. Gray (Catal. Lepid. Ins. Brit. Mus. 4to, 1852, p. 21) *Papilio castor* (sp. 93) is thus given:—

“♂. *Papilio castor*, Westw. Ann. Nat. Hist. ix. (1842), p. 37; id. Arc. Ent. pl. 80. figs. 1, 2 [2, 2\*]; E. Doubl. Gen. of D. Lep. pp. 12, 72.

“♀. *Papilio pollux*, Westw. Ann. Nat. Hist. ix. (1842), p. 37; id. Arc. Ent. pl. 90 [80], fig. 1; E. Doubl. Gen. D. Lep. pp. 21, 264.

“*Papilio xenocles*, pt., Erichs. Wieg. Arch. f. Naturg. 1843, ii. p. 248.

“In collection (Brit. Mus.) from Northern India.

“Variety a. ♂. Much less in size, and ornamented by small lunules along the outer margin, especially below the white space of the secondary wings. In collection (Brit. Mus.) from Northern India.”

In Mr. Hewitson's cabinet (bequeathed by him to the British Museum) the two species stood under the name of *P. castor*; and as such they appear in the printed catalogue of his collection (p. 3), without any reference to *P. pollux*.

Felder (Sp. Lepid., in Verh. Zool.-Botan. Gesellsch. Vienna, 1864, p. 320) gives as a separate section C, no. 244, *P. castor*, Westw., with *P. pollux* as its female, followed by no. 414, *P. phestus*, Guérin.

Kirby (Syn. Cat. Diurn. Lep. p. 546) gives *P. castor* as the male, and *P. pollux* as the female, of one species, “*teste Atkinson*.”

M. Charles Oberthür (Études Entomol. part iv. “Catal. rais. des Papilionidæ de la Collection de Ch. Oberthür,” p. 49, December 1879) gives as his species “85, ♂ *castor*, Westw. Arc. Ent. pl. 80. fig. 2; ♀ *pollux*, Westw. Arc. Ent. pl. 80. fig. 1;” but in his Appendix (p. 114) he states:—“L'honorable M. Westwood m'a informé qu'il était convaincu que *castor* et *pollux* étaient non plus l'un le ♂ et l'autre la ♀ d'une même espèce, mais bien deux espèces différentes dont il connaissait pour chacun les deux sexes<sup>1</sup>. J'ai reçu moi-même du Sikkim la ♀ *castor* semblable au ♂.” Here we have a distinct statement that the female of *P. castor* is similar to the male.

The figures which accompany the present memoir have been drawn with the view of showing the amount of variation undergone in the shape of the wing and in the markings of these Butterflies, and bearing on the question of their sexual modification and identity.

In Plate XLIV. fig. 1 the upperside of the hind wing of the ordinary form of the male of *P. castor* is shown, its form being compared with the outline of the hind wing of the female *P. pollux*. In this figure the rudimentary tailed wing of the former (\*), and the rounded wing of the latter (a b), are unmistakably apparent. In figure 2 the underside of the same wing of *P. castor* is delineated, showing the series of small submarginal spots, some of which are almost obsolete. Figure 3 represents the upperside of the hind wing of the smallest specimen which I have yet seen of *P. castor*, and

<sup>1</sup> This part of M. Oberthür's statement is erroneous, as I stated to him that I possessed the two sexes of *P. pollux*, but only males of *P. castor*, regarding at that time the Butterfly figured in Plate XLV. fig. 1, as the male of *P. pollux*.

which agrees with Mr. G. R. Gray's "variety  $\alpha$ " above mentioned; and figure 4 represents the underside of the hind wing of the typical *P. pollux*.

Plate XLV. fig. 2 represents a female insect from "India" in the Hopeian Collection, measuring  $4\frac{2}{3}$  inches in the expanse of the fore wings, which agrees with the female *P. pollux*, except that the discoidal fascia of the hind wings is reduced to a row of large hastate marks beyond the middle of the wing, not reaching upwards to the discoidal cell, more than half the basal portion of the wing thus being of uniform rich brown colour, slightly suffused beyond the middle with fulvous scales—the fascia of hastate spots being but slightly irrorated with dark scales, especially on the underside, and extending across the wing to the anal margin. The hind wings of this female specimen are of the rounded form of the ordinary females of *P. pollux*.

I have now to direct attention to another specimen from "India," also in the Hopeian collection, figured in Plate XLV. fig. 1, which is unquestionably a male, although it agrees so entirely in shape, colour, and markings with the female represented in fig. 2 on the same plate that it would be difficult to distinguish between them.

Here, therefore, we have a clear proof that the opposite sexes of the same species do not differ from each other, except in internal sexual organization.

Mr. Wood-Mason (Journal of the Asiatic Society of Bengal, vol. xlix. part ii. 1880, p. 144, plates viii. and ix.) has lately described the two last above-mentioned insects as the sexes of a new species, and has applied to it the name *P. dravidarum*, of which he has given a figure of the upperside alone of the male. The specimens described by Mr. Wood-Mason were received from the Kadur district, Mysore, and from Trevandrum. He considers my *P. castor* and *P. pollux* as the two sexes of a distinct species, observing that in *P. castor* "the sexes are, as regards colour and markings, as strongly differentiated from one another as in any species with which I am acquainted; they also differ to some extent in form, the male having the fore wing narrower, with the external margin obviously emarginate, and the hind wing also narrower and produced, with the same margin more deeply incised and lobed than in the female, both pairs of whose wings in form more or less closely resemble those of both sexes in the other two species," *P. dravidarum* and *P. mahadesa* from Burmah, whilst "in *P. dravidarum* the sexes agree perfectly both in form of the wings and markings, differing very slightly in colour only; so that but little sexual differentiation has here taken place."

With respect to the females of my *P. pollux*, Mr. Wood-Mason states that specimens from Assam, Cherra Punji, and Silhet have rounded hind wings, [whilst others from Silhet and Sikkim have "the third branch of the median vein produced into a small tooth."] Of one of these he gives a figure, named *P. castor* ♀, describing these latter specimens as having more distinctly cream-coloured hind wings than the rounded-winged ones. One of these light-coloured-

winged females is in the Hopcian collection, from Assam; and although this vein is produced rather more strongly than in the other darker specimens, yet the hind wings are clearly as round as in the others, and an inspection of Mr. Wood-Mason's two figures (pl. viii. fig. 2, and pl. ix. fig. 2) is surely sufficient to prove the specific identity of the two insects.

Of *P. dravidarum* Mr. Wood-Mason obtained a single specimen of each sex; this, however, is fully sufficient to show that the insect figured by me (Plate XLV. fig. 2) is either specifically distinct from the females of *P. pollux*, or that it is a local and permanent variety of that species peculiar to a more southern latitude, which may have tended to intensify the dark colour of the wings, and to limit the pale patches. Furthermore, Mr. Wood-Mason's descriptions and figures fully confirm my opinion that the two insects represented in my Plate XLV. are the two sexes of the same species or race, or geographical variety, as it may be considered. Here, then, we have the two sexes identical; and if (as I consider to be the case) the female is so generally identical with the female *P. pollux*, I think we are warranted in concluding that the real male of *P. pollux* has not yet been discovered, and that when found it will closely resemble the female both in the form of its wings, and in their characteristic suffused markings. The common *P. panope* is a perfectly analogous case, in which the two sexes of a species marked very like *P. pollux* are identical.

Mr. Wood-Mason adduces no sufficient proof that *P. castor* is the legitimate male of *P. pollux*; and I must be allowed to suggest that the analogy of those Butterflies which have a large white blotch on the hind wings placed as in *P. castor*, and in which the females have the same marks on the hind wings as the males, is of greater weight in determining the non-sexual identity of my two species than the unproved opinions of the authors quoted in the beginning of this paper; whilst the express statement of M. Ch. Oberthür that he possesses a female identical with my male *P. castor*, is sufficient to disprove the assertion of the specific identity of my two insects. It would, as it seems to me, be as improbable as if a new species of *Vanessa*, closely allied to *V. atalanta*, of which both the sexes are identical in colour, form, and markings, were discovered in which the male resembled *V. atalanta* and the female *V. io* or *V. poly-chloros*.

The question has, moreover, been further complicated by the occurrence of a singular gynandromorphous specimen of *P. pollux*, in the collection of Mr. Semper of Altona, who has been so good as to send me a photograph of it. The upper surface of this specimen is represented in Plate XLIV. fig. 5; and it has been described and figured in the Entomol. Monatschr. of Vienna, vol. vii. p. 281, pl. xix. The specimen is for the most part a female of the true *pollux* type, to which sex the wings belong, with the exception of the inner posterior portion of the right fore wing and the outer angle and costal area of the right hind wing, which portions are masculine. On comparing the shape of the hind wings and the markings of the outer angle of the same wings

of this monstrous individual with the same parts in the true female wings (see Plate XLIV. fig. 1, male, Plate XLIV. fig. 4, female *P. pollux*) it will be sufficiently clear that it is to the latter that the incipient male portion of the monster's wing is to be referred, and that, had the male characters been fully developed, we should have seen a specimen marked, like the female, with a row of large hastate marks running across the hind wings, not, however, suffused towards the base of the wing as in fig. 4, nor confined to the outer angle of the wings as in figures 1 and 3, and wanting the large 4-partite white patch of *P. castor*, of which there is no trace in Mr. Semper's insect.

## EXPLANATION OF THE PLATES.

## PLATE XLIV.

- Fig. 1. *Papilio castor* ♂, upper surface right hind wing.  
 2. *P. castor* ♂, under surface right hind wing.  
 3. *P. castor* ♂, upper surface right hind wing of small variety.  
 4. *P. pollux* ♀, underside of right hind wing.  
 5. Gynandromorphous specimen of *P. pollux*.

## PLATE XLV.

- Fig. 1. *Papilio pollux*, local variety? (*P. dravidarum*, Wood-Mason), male.  
 2. " " " " (female).

7. On the Birds of the Vicinity of Lima, Peru. By P. L. SCLATER, M.A., Ph.D., F.R.S. With Notes on their Habits by Prof. W. NATION, of Lima, C.M.Z.S. (Part V.)<sup>1</sup>

[Received March 21, 1881.]

## (Plate XLVI.)

The small collection lately received from our Corresponding Member, Prof. W. Nation, of Lima, which I now exhibit, serves to show us how far, as yet, from being exhausted, even in the generally well-known class of Birds, are the Andes of Peru. Out of the twelve species represented in the present series, two appear to be new to science, and several others (e. g. *Polyonymus caroli* and *Metallura opaca*) are of much rarity.

Prof. Nation, who has fortunately passed with safety the ordeal of the capture of Lima by the Chilian army, writes me word that two friends, Mr. Dallas and Mr. Turfield, passing a holiday on the Cordillera, agreed at his request to shoot such birds as they came across, and to forward the same in the flesh to him in Lima. The result of this plan exceeded Prof. Nation's utmost expectations; 150 specimens were secured, of which sixteen were new to Prof. Nation's collection.

It is a selection from the birds so obtained that I now exhibit.

<sup>1</sup> Continued from P. Z. S. 1871, p. 498.

8. On the Genus *Gouldia* of C. B. Adams, and on a new Species of *Crassatella*. By EDGAR A. SMITH.

[Received March 15, 1881.]

Special attention having been called to the name *Gouldia* in the volume of the Society's 'Proceedings' for 1879 (p. 131) by Mr. W. H. Dall, in a communication entitled "On the Use of the generic name *Gouldia* in Zoology," I beg to present to the Society a few observations on the Molluscan group bearing this designation. Having recently had occasion to examine some of the shells which have been described under that name, I find that it is untenable; and therefore the genus *Gouldia* of Bonaparte is left free for adoption by ornithologists.

The types of Adams's genus were two species from the West Indies, *G. cerina* and *G. parva*. Of these the former proves to be a species of *Circe*, and the latter a small *Crassatella*. This (*parva*), says Carpenter (Mazatlan Cat. p. 82), "bears a general resemblance to *Circe minima*." This, however, must be erroneous, probably a *lapsus calami*. He states that he examined specimens of *G. parva* in Mr. Cuming's collection; these, however, I cannot now find; and it appears to me that it was, in all probability, the *G. cerina* which he had before him, specimens of which are preserved in the Cumingian collection. The latter *does* "bear a general resemblance to *Circe minima*," whilst the description of *G. parva* in no way accords with it, but rather characterizes one of the *Crassatelloid* species found in the West Indies, which have been assigned to *Gouldia*. C. B. Adams's description runs thus:—"Testâ *Astarte* affini, sed dente laterali remotâ anteriore in utrâque valvâ instructâ; pallii impressione vix vel haud sinuatâ."

These characters do not well apply to the first of his species, *G. cerina*; for that is very unlike an *Astarte*, lacking the epidermis so characteristic of that group, and having coloured markings, which, with one exception, are altogether absent in the genus referred to. I am therefore inclined to believe that the *Astartoid* resemblance referred to the second species, *G. parva*, his description being applicable to *Astarte*, and the shell which I refer to it certainly not unlike that genus, being compressed and strongly concentrically ridged and sulcate.

Adams's generic diagnosis (Proc. Bost. Soc. Nat. Hist., 1845, vol. ii. p. 9) makes no mention of the hinge-ligament. In his *G. cerina*, however, it is semiexternal, as in *Circe*, whilst in his *G. parva* and *G. pacifica* it is internal, as in *Crassatella*. This has been pointed out by Carpenter in 1863, in his Supplementary Report on the Mollusca of the West Coast of North America, p. 544, where he observes, "It appears that *Gouldia* (*Thetis*, C. B. Ad. olim, non Sowerby, nec H. and A. Ad.) is congeneric with "*Circe*" *minima*, not with the *Astartids*. Prof. Adams's fresh specimens of his *G. pacifica* prove to have the *crassatelloid* internal

ligament, and represent one of the many remarkable forms of that group." Jeffreys also (Brit. Con. ii. p. 321) has pointed out the identity of *Gouldia* and *Circe*.

*A List of Species which have been referred to the Genus Gouldia.*

1848. *Gouldia pfeifferi*, Philippi. Cuba.  
Philippi, Zeitsch. Malakol. vol. v. p. 133 (as *Astarte*);  
Tryon, Proc. Acad. Nat. Sci. Philad. 1872, p. 249 (as  
*Gouldia*).
1857. *Gouldia varians*, Carpenter. Mazatlan.  
Carpenter, Cat. Mazatlan, p. 83.
1845. *Gouldia mactracea*, Linsley. United States.  
Linsley, Amer. Journ. Sci. Arts, vol. xlviii. p. 275, wood-  
cut (as *Astarte*); Gould, Invert. Mass. ed. 2, 1870, p. 128,  
fig. 442 (as *Gouldia*).
1873. *Gouldia isabella*, Hutton. New Zealand.  
Hutton, Cat. Shells of New Zealand, p. 76.  
= *Crassatella bellula*, A. Adams; Hutton, Man. New  
Zeal. Moll. p. 158.
1861. *Gouldia dilecta*, Gould. Kagosima, Japan.  
Gould, Proc. Bost. Soc. Nat. Hist. vol. viii. p. 32; Otia  
Conch. p. 170.
1862. *Gouldia fastigiata*, Gould. North Carolina.  
Gould, Proc. Bost. Soc. Nat. Hist. vol. viii. p. 282; Otia  
Conch. p. 239.
1865. *Gouldia australis*, Angas. Port Jackson.  
Angas, Proc. Zool. Soc. 1865, p. 459; 1867, p. 928.
1869. *Gouldia modesta*, H. Adams. Gulf of Tunis.  
H. Adams, Proc. Zool. Soc. 1869, p. 275, pl. 19. f. 14.
1803. *Gouldia minima*, Montagu. Great Britain.  
Montagu, Adams's Genera, vol. ii. p. 485.
1845. *Gouldia cerina*, C. B. Adams. Jamaica.  
C. B. Adams, Proc. Bost. Soc. Nat. Hist. p. 9; Reeve,  
Conch. Icon. sp. 140 (as *Venus*).
1845. *Gouldia parva*, C. B. Adams. Jamaica.  
C. B. Adams, *l. c.* p. 9.
1841. *Gouldia martinicensis*, d'Orbigny.  
D'Orbigny, Sagra's Hist. Cuba, vol. ii. p. 288, pl. 27.  
figs. 24-26 (as *Crassatella*); Adams, Gen. Moll. vol. ii.  
p. 485 (as *Gouldia*).
1841. *Gouldia guadaloupensis*, d'Orbigny.  
D'Orbigny, *l. c.* p. 289, pl. 27. figs. 24-26 (as *Crassa-*  
*tella*); Adams, *l. c.* p. 485 (as *Gouldia*).
1852. *Gouldia pacifica*, C. B. Adams. Panama.  
C. B. Adams, Panama Shells, p. 275.
1869. *Gouldia lamellosa*, Issel. Red Sea.  
Issel, Mal. Mar. Ross. p. 73, pl. i. fig. 7.

Of the above-named species, *Gouldia pfeifferi*, *variens*, *mactracea*, *isabella*, *parva*, *martinicensis*, *guadaloupensis*, *pacifica*, *fastigiata*, and

*modesta* are small forms of the genus *Crassatella*. *Gouldiae minima*, *cerina*, *australis*, and perhaps *dilecta*, which I only know from description, prove to belong to *Circe*; and *G. lamellosa* is unknown to me. Of the former group, four species, viz. *guadeloupensis*, *parva*, *mactracea*, and *pfeifferi*, are, I believe, one and the same shell, and may retain d'Orbigny's name, which was the first published. In conclusion I will add the description of a small species of *Crassatella* from the west coast of Africa.

CRASSATELLA KNOCKERI, sp. nov.

Shell small, transparent whitish, angular at the beaks, rounded on the ventral margins, compressed, a little inequilateral, concentrically ribbed. Ribs strong, terminating anteriorly at the narrow shallow lunule, and posteriorly defining a very narrow linear dorsal area separated by deep sulci rather broader than the ridges. Umbones small, smooth, hyaline, approximated; anterior and hinder dorsal slopes subequal, the former feebly concave, the latter rectilinear. Hinge consisting of two cardinal teeth in the right valve, the anterior one very conspicuous, the other very small; and two in the left of more equal size. Lateral teeth elongate, one on the posterior slope of the right valve, fitting into a corresponding groove in the left, and one on the anterior slope of the latter received by a groove in the right. Ligament placed in a cavity immediately posterior to the two cardinal teeth of the left valve, and between those of the right. Interior of valves glossy, exhibiting the external ribbing, owing to their transparency, prettily crenulated within along the ventral margin. Length from umbo to opposite margin  $4\frac{1}{3}$  millim., width  $4\frac{1}{2}$ , diam.  $1\frac{1}{2}$ .

*Hab.* Whydah, West Africa (dredged by Captain Knocker, R.N.).

Although of small size, this pretty shell appears to be adult; and the crenulated inner edge of the valves indicates maturity. Its transparent texture is peculiar; and it is very stoutly costate for so small a species.

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May 3, 1881.

Professor Flower, LL.D., F.R.S., President, in the Chair.

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The following papers were read:—

1. Contributions to the Systematic Arrangement of the Asteroidea.—I. The Species of the genus *Asterias*. By F. JEFFREY BELL, M.A., F.Z.S., Professor of Comparative Anatomy in King's College.

[Received March 21, 1881.]

(Plates XLVII. & XLVIII.).

The amount of variation exhibited by the species of the genus *Asterias* has, as might have been expected, led to the formation of a large number of forms which are at any rate nominally distinct. Tempting as the work of revision of such a genus ought to be, it has never attracted the attention of any zoologist who has written on the subject since the time of Müller and Troschel (1842). The most important and comprehensive work which has appeared is that of M. le Prof. Edmond Perrier, of the Jardin des Plantes. This essay, which was originally published in that still young but already so fertile journal the 'Archives de Zoologie expérimentale' of M. Lacaze-Duthiers, has since appeared separately<sup>1</sup>.

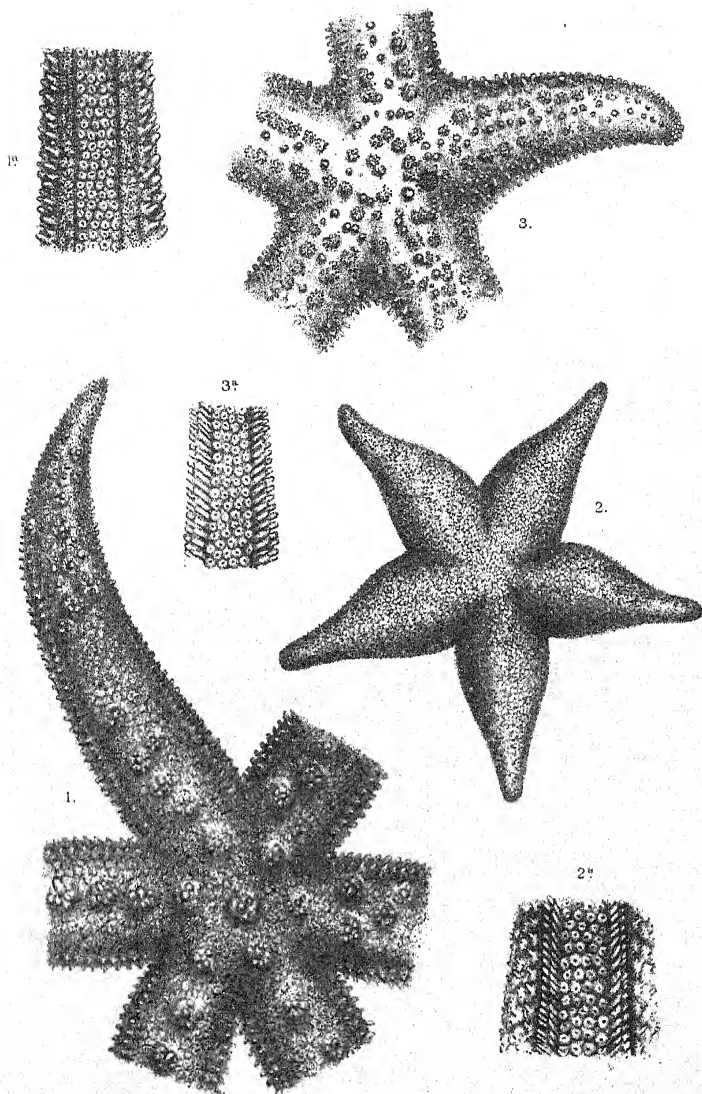
M. Perrier's work, though bearing the unambitious title of 'Révision de la Collection de Stellérides du Muséum d'histoire naturelle de Paris,' is so far extensive in its scope that it contains also a revision of the specimens in the British Museum, and descriptions of a number of the new species therein contained. In so far as Prof. Perrier has done his best to get their full value out of the descriptions of Dr. J. E. Gray, which, it must be owned, are peculiarly insufficient and unsatisfactory, and has also been in some cases bold enough to describe new species from single specimens, he has relieved me of two duties, which are always unpleasant.

Much, however, as M. Perrier has done with and for the genus *Asterias*, it would be not proper to pretend to say that he has given a complete revision of the genus: he details only forty-nine species, and does but little to indicate the affinities of the species he mentions, and nothing at all as to resolving them into either natural or artificial groups.

Nor can the present essay ask to be regarded as any thing else than a tentative effort in the direction of a complete revision. The collection in the British Museum is still in want of a number of described species; while, on the other hand, we must wait for a more perfect monograph till the specimens, which were doubtless collected by the 'Challenger,' and are now being worked out under able hands elsewhere, shall have found their proper place in the stores of the national collection. The rich collection made under the supervision of Mr. Alex. Agassiz will soon be described by M. Perrier.

<sup>1</sup> Paris (Reinwald, 1875).



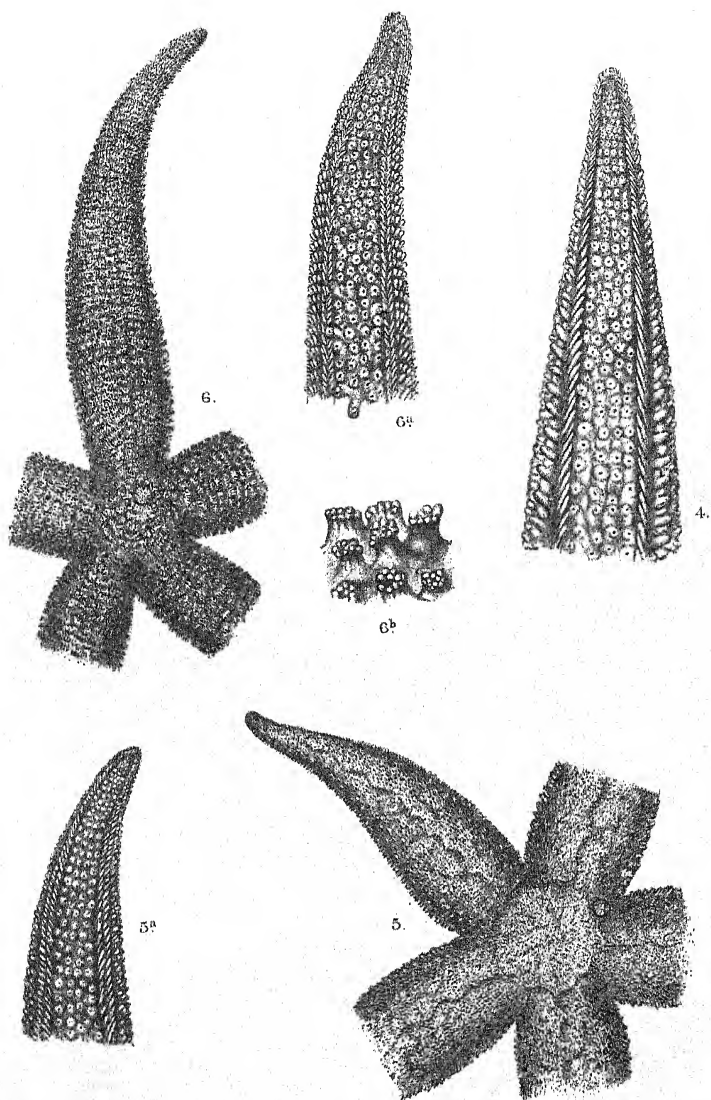


C. Berjeau del. et lith.

Mintern. Eros imp.

1. *ASTERIAS PHILIPPI*.  
 2. 2<sup>a</sup> *A. INERMIS*.  
 3. 3<sup>a</sup> *A. VERRILLI*.





C. Berjeau del et lith.

Mintern Bros. inc.

4. ASTERIAS SPIRABILIS  
5. 5<sup>a</sup>. A. ROLLESTONI.



A synonymic Catalogue of the Asterida being, then, a desideratum for which we must still wait, I have here endeavoured to aid the author of that future catalogue by an attempt to adopt a method by which it will, as I hope, be easier than heretofore to recognize rapidly the characters of species already described, and to see what has been already more or less definitely effected in the determination of the synonymy.

The arrangement of the species either by natural characters, or by special points arbitrarily selected on account of their real or apparent convenience, has necessitated the careful examination of the characters of the species already represented by specimens in the British Museum, and the close study of the descriptions of the unrepresented species. When these descriptions are examined with a view to obtain from them information as to certain characters, we are soon struck by the variation in the modes of description, by which this group has suffered so much.

In directing attention, therefore, to the points by which, as I imagine, we can most satisfactorily and conveniently group the numerous species of this genus, I would take the opportunity of urging on those naturalists in whose care rare species may be, or to whom new species may come, to give us definite and exact information on these points, without, however, any prejudice to other structural characters which, seemingly useless at present, may to more sagacious naturalists prove to be of the highest systematic value.

There are some species described by Dr. Gray which it will, I believe, never be possible to recognize; no specimens in the Museum bear the labels of the names *A. echinata*, *A. aster*, *A. wilkinsonii*, and *A. multiradiata* (*Heliaster*); and the descriptions that are given are certainly no aid at all to their identification. I propose to omit these names altogether from all the succeeding lists<sup>1</sup>.

Of these lists, the first gives a catalogue of the names which have been applied to forms which are at present supposed to be specifically distinct from one another; to all these names there is added a reference to a work in which the species has been more or less completely described. In the case of nearly all descriptions made previously to the year 1840, reference is made to the account given by Müller and Troschel in their 'System der Asteriden;' in the case of Brandt reference is made, unless otherwise noted, to the 'Prodromus descriptionis Animalium ab H. Mertensio . . . observatorum,' published at St. Petersburg in 1835<sup>1</sup>. The papers of Dr. Stimpson are

<sup>1</sup> The following quotations from a letter in which Prof. Perrier was kind enough to answer some questions which I addressed to him will show how far we are in accord on this point:—"Il m'a été impossible de retrouver au Museum l'*Asterias bootes* de Müller et Troschel, et je n'ai conservé le nom dans mes listes qu'à cause de l'autorité de ces auteurs.

"Je vous en dirai autant des *Asterias aster* et *A. wilkinsonii* que je n'ai pu retrouver ni au British Museum ni ailleurs, et qui ne sont pas reconnaissables d'après les descriptions de Gray."

referred to by the numbers i., ii., iii. in brackets after his name ; and these numbers refer respectively to :—

(i.) "On new Genera and Species of Starfishes of the Family Pycnopodidæ (*Asteracanthion*, Müller and Troschel)." Proc. Boston Soc. of Nat. Hist. viii. pp. 261–273.

(ii.) "Synopsis of the Marine Invertebrata of Grand Manan." 1853, Smithsonian Contributions.

(iii.) "Crustacea and Echinodermata of the Pacific Shores of North America." Boston Journ. Nat. Hist. vi. (1857).

The papers of Dr. Lütken to which references are made are contained in the 'Videnskabelige Meddelelser' (Copenhagen) for various years, which are distinguished by their respective dates.

So, too, the papers of Philippi which appeared in Wiegmann's 'Archiv für Naturgeschichte' are distinguished from one another by the year of their publication.

In the case of Dr. Gray, reference is made to his beautifully illustrated 'Synopsis of the Species of Starfish in the British Museum' (1866).

And, finally, when p. and a number follow alone the name of Perrier, reference is made to the already mentioned 'Révision,' and to the pagination of it as a separate publication.

In other cases the references given are so full as to need no explanation.

The letters B.M. are placed against the names of the species specimens of which are in the British Museum.

*I. List of the Species of Asterias now regarded as distinct.*

1. *acervata*, Stimpson (i.), p. 271.
2. *acutispina*, Stimpson (i.), p. 262.
3. *æqualis*, Stimpson (i.), p. 273.
4. *africana*, M. Tr. p. 15. (B.M.)
5. *alba*, Bell, P. Z. S. 1881, p. 92. (B.M.)
6. *amurensis*, Lütken (1871), p. 296. (B.M.)
7. *antarctica*, Lütken (1856), p. 105. (B.M.)
8. *bootes*, Müller and Troschel, p. 17.
9. *borbonica*, Perrier, p. 61.
10. *brachiata*, Perrier, p. 65.
11. *brandti*, Bell, P. Z. S. 1881, p. 91. (B.M.)
12. *brevispina*, Stimpson (ii.), p. 88.
13. *calamaria*, Gray, p. 1. (B.M.)
14. *camschatica*, Brandt, Prod. p. 70.
15. *capensis*, Perrier, p. 73. (B.M.)
16. *capitata*, Stimpson (i.), p. 264.
17. *clavatum*, Philippi, 1870, p. 269.
18. *compta*, Stimpson (i.), p. 270.
19. *conferta*, Stimpson (i.), p. 263.
20. *cribraria*, Stimpson (i.), p. 270. (B.M.)

<sup>1</sup> And also published in the Rec. des Actes de l'Acad. Imp. de St. Pétersbourg for 1834.

21. *cunninghami*, Perrier, p. 73. (B.M.)
22. *disticha*, Brandt, Middendorff's Reise, p. 31.
23. *epichlora*, Brandt, p. 70. (B.M.)
24. *fissispina*, Stimpson (i.), p. 264.
25. *forbesi*, Desor, Proc. Bost. Soc. iii., p. 67. (B.M.)
26. *fulgens*, Philippi, 1870, p. 274.
27. *fulva*, Philippi, 1870, p. 270.
28. *fungifera*, Perrier, p. 73.
29. *gelatinosa*, Meyen, Reise, i. p. 222. (B.M.)
30. *gemmifer*, Perrier, Ann. Sc. Nat. 1869, xii. p. 237.
31. *germaini*, Philippi, 1858, p. 266.
32. *glacialis*, M. Tr. p. 14. (B.M.)
33. *grœnlandica*, Steenstrup, Vid. Med. 1854, p. 260. (B.M.)
34. *hexactis*, Stimpson (i.), p. 272.
35. *hispidâ* (Pennant), Forbes's British Starfishes, p. 95. (B.M.)
36. *ianthina*, Brandt, p. 69<sup>1</sup>.
37. *japonica*, Stimpson<sup>2</sup>. (B.M.)
38. *katherinæ*, Gray, p. 2. (B.M.)
39. *linckii*, M. Tr. p. 18.
40. *littoralis*, Stimpson<sup>3</sup> (ii.), p. 14. (B.M.)
41. *luetkeni*, Stimpson (i.), p. 265.
42. *lurida*, Philippi, 1858, p. 265.
43. *margaritifer*, M. Tr. p. 20.
44. *meridionalis*, Perrier, p. 76. (B.M.)
45. *mexicana*, Lütken (1859), p. 94.
46. *mitis*, Philippi, 1870, p. 272.
47. *mollis*, Hutton, P. Z. S. 1872, p. 812.  
*mollis*, Studer, Mb. Ak. Berl. 1876, p. 457 (see *studerii*).
48. *muelleri*, Sars, Arch. f. Naturg. xx. (1844), p. 169. (B.M.)
49. *neglecta*, Bell, P. Z. S. 1881, p. 94.
50. *nuda*, Perrier, p. 71. (B.M.)
51. *obtusispinosa*, Bell, P. Z. S. 1881, p. 92. (B.M.)
52. *ochotensis*, Brandt, Middendorff's Reise, p. 28. (B.M.)
53. *ochracea*, Brandt, p. 69. (B.M.)
54. *panopla*, Stuxberg, Gef. Vet.-Ak. 1878, iii. p. 32.
55. *paucispina*, Stimpson (i.), p. 266. (B.M.)
56. *pectinata*, Brandt, p. 70.
57. *perrieri*, Smith, Ann. N. H. (4) xvii. p. 106. (B.M.)
58. *polaris*<sup>4</sup>, M. Tr. p. 16. (B.M.)
59. *polyplax*, Arch. für Naturg. 1844, p. 178. (B.M.)
60. *rarispina*, Perrier, p. 62. (B.M.)

<sup>1</sup> Probably a variety of *A. ochracea*, Brandt (Stimpson (iii.) p. 87).

<sup>2</sup> I have searched for, but have been unable to find any description of this species (*v. infra*).

<sup>3</sup> This reference seems, by some accident, to have been dropped out from M. Perrier's bibliography, *s. v.* p. 51.

<sup>4</sup> It must be remembered that Müller and Troschel used the generic term *Asteracanthion*; they were therefore within their rights in using the specific term *polaris*, although *Asterias polaris* was the name given (1824) by Sabine to *Ctenodiscus cristatus*.

61. *rodolphi*, Perrier, p. 41. (B.M.)
62. *rubens*, M. Tr. p. 17. (B.M.)
63. *rugispina*<sup>1</sup>, Stimpson (i.) p. 267. (B.M.)
64. *rupicola*, Verrill, Bull. U. S. Nat. Mus. i. 3, p. 71. (B.M.)
65. *scaber*, Hutton, P. Z. S. 1872, p. 812.
66. *sertulifera*, Xantus, Proc. Acad. Nat. Sc. Philad. 1860, p. 568.
67. *sinusoida*, Perrier, p. 74. (B.M.)
68. *spectabilis*, Philippi, 1870, p. 271.
69. *stellionura*, Perrier, Ann. Sc. Nat. xii. (1869), p. 240. (B.M.)
70. *studerii*, Bell, P. Z. S. 1881, p. 91 (*mollis*, Studer).
71. *sulcifer*, Perrier, Ann. Sc. Nat. xii. (1869), p. 235. (B.M.)
72. *tenera*, Stimpson (i.), p. 269. (B.M.)
73. *tenuispina*, M. Tr. p. 16. (B.M.)
74. *troscheli*, Stimpson (i.), p. 267. (B.M.)
75. *vancouveri*, Perrier, p. 64. (B.M.)
76. *varia*, Philippi, 1870, p. 272.
77. *vulgaris*, Verrill, Proc. Bost. Soc. N. H. x. (1866), p. 347.

The list which now follows gives, in alphabetical order, the more important of the specific titles which have been applied to species previously named. The list has been here limited to those forms which have been regarded by competent naturalists as members of the genus, as defined and limited by Müller and Troschel, or what may, for brevity, be styled the *Asteracanthion* division of the Asterida.

I may, in passing, be allowed to beg leave to be excused from entering into any defence of the use of the generic term *Asterias*. I can add nothing to the summary of contending facts which have been put out by the Rev. A. M. Norman<sup>2</sup>; and I willingly give in my adhesion to the majority of his arguments. The labours of synonymy are severe enough to justify me in refusing to go again into a detailed examination of a subject which seems to me to have been exhausted<sup>3</sup>.

To the left of some of the names there is placed the name of an authority who has directed attention to the synonymy of the species in question.

## II. List of the Principal Names which are regarded as Synonyms.

1. *albulus*, Stimpson, = *Stichaster albulus*.
2. *angulosa*, O. F. M., = *glacialis*, O. F. M.
- (Verrill.) 3. *arenicola*, Stimpson, = *forbesi*, Desor.
- (Lütken.) 4. *atlantica*, Verrill, = *tenuispina*, Lamk.
5. *aurantiaca*, Meyen, = *Stichaster aurantiacus*.

<sup>1</sup> If the specimens collected by Dr. Cunningham have been correctly identified, *A. rugispina* must be very closely allied to *A. antarctica*.

<sup>2</sup> Annals and Mag. Nat. Hist. (3) xv. p. 126.

<sup>3</sup> Compare also the note by Verrill in the Proc. Boston Soc. Nat. Hist. x. (1866), p. 339.



- (Perrier.) 6. *australis*, Perrier, = *calamaria*, Gray.  
 (Verrill.) 7. *beryllinus*, A. Ag., = *forbesi*, Desor.  
 (Verrill.) 8. *borealis*, Perrier, = *polaris*, M. Tr.  
 9. *clathrata*, Pennant, = *rubens*, Linn.  
 9a. *douglasi*, Perrier, = *polaris*<sup>1</sup>.  
 10. *fabricii*, Perrier, = *vulgaris*.  
 11. *gigantea*, Stimpson, = *katherinæ*, Gray  
 (Perrier.) 12. *glacialis*, Grube, = *tenuispina*, Link.  
 13. *glacialis*, Johnston, = *rubens*, L.  
 14. *globifera*, Gray, = *Uniophora globifera*.  
 15. *granifera*, Lamk., = *U. granifera*.  
 16. *holsatica*, Retzius, = *rubens*, L.  
 17. *jehennesi*, Perrier, = *calamaria*, Gray.  
 18. *maderensis*, Stimpson, = *webbiana*, D'Orb. = *glacialis*, O. F. M.  
 19. *minuta*, Retzius, = *rubens*, L.  
 20. *novæ-boracensis*, Perrier, = *forbesi*.  
 (Verrill.) 21. *pallida*, Perrier, = *vulgaris*, Packard.  
 22. *palæocrystallus*, Sladen, = *Pedicellaster palæocrystallus*, L.  
 23. *problema*, Steenstrup, = *Stichaster albulus*.  
 24. *roseus*, O. F. M., = *S. roseus*.  
 (Perrier.) 25. *rubens*, Gould (part.), = *vulgaris*, Packard.  
 26. *rubens*, Stimpson, = *vulgaris*, Packard.  
 27. *rubens*, Duj. and Hupé (part.), = *polaris*, M. Tr.  
 28. *rustica*, Gray, = *gelatinosa*, Meyen.  
 (Perrier.) 29. *savaresii*, Delle Chiaje, = *tenuispina*, Lamk.  
 (Perrier.) 30. *spinosa*, Say (part.), = *vulgaris*, Packard.  
 31. *stimpsoni*, Verrill, = *vulgaris*, Packard.  
 32. *striatus*, M. Tr., = *Valvaster striatus*.  
 33. *violacea*, O. F. M., = *rubens*, L.  
 34. *webbiana*, D'Orbigny, = *glacialis*<sup>2</sup>, O. F. M.

## Sp. inc. sedis.

*A. microdiscus* (Stimpson); see Lütken, Ann. N. H. (4) xii. p. 329.

<sup>1</sup> M. Perrier's decision, as communicated to me by letter.

<sup>2</sup> I owe this synonymy to M. Perrier. On comparing the description of D'Orbigny with undoubted specimens of "*A. maderensis*," Stimpson, I came to the conclusion that the species were identical. Thinking it remarkable that this resemblance had not before been noted, I wrote to Prof. Perrier asking him if he had in the Jardin des Plantes the type of *A. webbiana*. He answered "J'ai sous les yeux le type de l'*A. webbiana* de d'Orbigny; mais je suis convaincu, sans pouvoir cependant l'affirmer d'une manière absolue, que c'est seulement, comme l'*A. maderensis*, une forme de l'*Asterias glacialis*." On comparing specimens named by M. Perrier, in the British Museum, of these last two species, I too feel convinced that they are identical. We have, then,

*Asterias glacialis*, O. F. Müller; Müller and Troschel, System der Asteriden, p. 44; &c.

*Stellonia webbiana*, d'Orbigny, in Webb and Berthelot's Iles Canaries, Zool. (Moll.), p. 142, pl. ii. figs. 8-13.

*Asteracanthion webbianum*, Duj. and Hupé, Echin. p. 350.

*Asterias maderensis*, Stimpson, Proc. Boston, Soc. N. H. 1861-62, p. 263.

It will be of interest to institute a comparison between the two lists here given and that of M. Perrier. Here we find altogether the not inconsiderable number of one hundred and eleven specific appellations; and of this only thirty-five are to be found in the second or synonymic list. M. Perrier describes all together forty-nine species; and when we look through his synonymy, we find that all together he makes mention of sixty-eight names. The proportion of accepted to synonymous terms is therefore almost exactly the same in the two lists. This is, I must say, a somewhat painful state of things; for I am inclined to regard an increase in the number of proved synonyms as a not unfair proof of advance in our knowledge of the forms described.

Advance of knowledge has, however, so far taken place since the publication of Perrier's 'Révision,' that our knowledge of the Arctic fauna and of that of the more southern seas has been somewhat increased, while the critical remarks of Verrill have somewhat reduced the number of species which, named by Valenciennes or by himself, M. Perrier had regarded as undescribed.

Comparatively lately (1878) Prof. Perrier has published an essay on the Geographical Distribution of the Starfishes, in the 'Nouvelles Archives du Muséum' (2<sup>me</sup> sér.); and in the nearly complete list of species which he there gives, he enumerates eighty-two species in the genus *Asterias*, or five more than are named in the list just given. This new list moreover contains the names of seven species not detailed by M. Perrier, viz.:—*A. mollis* of Studer (*studerii* of Bell); *A. perrieri*, E. Smith; *A. fulgens*, Philippi; and *A. alba*, *brandti*, *neglecta*, and *obtus-spinosa* of Bell.

On the other hand, M. Perrier's list contains the following, which, as I think, have been demonstrated by Verrill to be synonymous of names already entered, viz. *A. arenicola*, *A. borealis*, *A. fabricii*, *A. pallida*, and *A. stimpsoni*. *A. madeirensis* I have shown to be synonymous with *A. webbiana*; *A. globifera* will be placed with *Uniophora*: *A. wilkinsoni* and *A. aster* of Gray I cannot, as I have already said, even pretend to recognize. *A. jehennesi* would appear to be the same as *A. calamaria*.

Like M. Perrier, I retain in the lists the name of *A. bootes*, "à cause de l'autorité de ses auteurs;" but as the type is lost or unknown, the species will probably always be—what it has already been called, one of the "mysteries of Paris."

Of late years the only catalogue of the genus which claimed to be complete was published by MM. Dujardin and Hupé; it details, however, only thirty-seven species, of which nine have, with the progress of our knowledge, been since referred to other generic divisions.

This brief review will, I think, be sufficient to afford evidence of the pressing necessity of a closer and more critical study of the constituent species; what now will follow is to be regarded as a preliminary attempt to make some sort of introduction to a work

of greater value which neither specimens nor opportunities yet allow<sup>1</sup>.

I now proceed to the consideration of the heads under which the numerous species of this genus are to be grouped. The genus *Asteracanthion* of Müller and Troschel was divided by a single *coup* into a group with spines on the back, and a group with stalked knobs on the back; those of the former group alone are now members of the emended genus. No other zoologist has, so far as I know, attempted any convenient grouping of the species, though Dr. Stimpson has rendered some assistance in this direction by pointing out the affinities of the species he describes.

It is, at the same time, obvious enough that there is a very large number of species in the restricted and emended genus *Asterias*; and the number is unwieldy even now, when our knowledge of the variations that may be found in it is very possibly altogether elementary. No good, however, is gained by hastily accepting or proposing ill-defined generic *coups*; the more necessary work just now is to sort out the species into different categories. These must be as natural as they can be; but where nature fails us, or becomes too obscure for our vision, we must make use of what are not so satisfactorily natural characters.

It is necessary to make some such preface as this, because I have to propose a primary subdivision of the genus to which, from purely theoretical considerations, it would be possible to raise some not unimportant objections; for I propose, first of all, to separate the species into those in which there are developed more than five rays, and those in which, so far as we know, the number five is constantly retained. To these two groups I propose to apply the terms *Heteractinida* and *Pentactinida*<sup>2</sup>.

It is, so far as is yet known, only among the former, or *Heteractinida*, that the presence of more than one madreporic plate has been noted, though in forms which belong to the *Heteractinida*, but in which five arms only are developed (and this is not only a possible, but an actual case) there may be, and at times are, two madreporites. The plurality of madreporic plates affords a good secondary point of difference; and I propose, therefore, to form subdivisions which may respectively be known as *polyplacid* and *monoplacid*.

The third distinctive character lies in the number of spines which border the ambulacra—the adambulacral spines: as an ordinary rule, one finds one or two rows of these; and the forms which belong to them may be distinguished respectively as *Monacanthida* and *Diplacanthida*.

It is a difficult matter to say exactly what is the real significance of the difference in the number of the rows of adambulacral spines. In the first place, it is necessary that we should have for a number

<sup>1</sup> This might almost be an echo of the words of Prof. Alex. Agassiz (see 'North-American Starfishes,' p. 122).

<sup>2</sup> Whether this division be natural or artificial, it will, for the great majority be found, I think, to work pretty satisfactorily: the problem of heteractinism is still unsolved; and it is a serious question whether the heteractinism of e. g. *A. tenuispina* is exactly comparable to the polyactinism of e. g. *Heliaster*.

of rare species more exact and definite information than has yet been afforded. But little light is thrown upon the subject by a reference to the characters which obtain in *Brisinga*, owing to the extremely generalized character of that important form; the adambulacral spines are, according to the careful description of G. O. Sars, arranged in the adult in three longitudinal rows, of which those of the outermost row are distinctly the longest; "in very young specimens," however, it is to be noted that the "two innermost are yet undeveloped, so that there is only a single longitudinal row of furrow-spines along the middle of the adambulacral areas."

Although there is this tendency to a disposition of the adambulacral spines in one or two rows, there are (a) cases, e. g. *A. panopla*, Stuxberg, in which there are three rows, and (β) specimens of the common and widely-spread *A. rubens* and of other species which do not always exhibit a constant regularity: the spines may be set more or less distinctly along three planes; but it is rarely that three spines are found on one and the same plate; and it is clear that there is a tendency to the development of a single continuous series, arranged as nearly as possible in a perfectly straight row. If, further, we consider how extremely short is the longitudinal axis of the ossicles, and the size of the spines that are placed on them, and that the packing of the spines does nevertheless diverge but little into any thing whatsoever of a zigzag arrangement, we are, I think, justified for the present in not enforcing any such further subdivision as would be expressed by such terms as *isacanthid* and *anisacanthid*.<sup>1</sup>

There is a considerable body of fact which would justify such a division; but there is need of further study and fuller information to enable us to speak definitely as to the permanency of any real anisacanthid arrangement; the species in the following lists, which are distinguished by an asterisk sign are those in which this irregularity is most conspicuous.

### III. Primary Groups of the Species of Asterias.

#### A. HETERACTINIDA.

##### I. POLYPLACIDA.

##### i. MONACANTHIDA.

*calamaria.* *tenuispina.*

##### ii. DIPLACANTHIDA.

\**acutispina.* *polyplax.*  
*capensis.*

#### II. MONOPLACIDA.

##### i. MONACANTHIDA.

*gelatinosa.* *perrieri.*  
*gemmifer.* *rodolphi.*  
*katherinæ.*

<sup>1</sup> These terms would, of course, express the difference between forms in which the spines are the same in number on all the plates, and those in which the spines are unequally distributed.

*A. æqualis* probably belongs to this group ; but we have not sufficiently definite information as to the number of the madreporic plates, or of the rows of adambulacral spines.]

## ii. DIPLACANTHIDA.

<i>acervata.</i>	<i>polaris.</i>
<i>borealis.</i>	<i>scabra.</i>
<i>douglasi.</i>	<i>studerii.</i>
<i>hexactis.</i>	<i>*vancouveri.</i>
<i>meridionalis.</i>	

Sp. incertæ sedis.

*camtschatica.*

## B. PENTACTINIDA.

### i. MONACANTHIDA.

<i>africana.</i>	<i>glacialis.</i>
<i>antarctica.</i>	<i>luetkeni.</i>
<i>borbonica.</i>	<i>margaritifera.</i>
<i>*brachiata.</i>	<i>mexicana.</i>
<i>brevispina.</i>	<i>paucispina.</i>
<i>capitata.</i>	<i>rarispina.</i>
<i>compta.</i>	<i>rugispina.</i>
<i>conferta.</i>	<i>rupicola.</i>
<i>cunninghami.</i>	<i>sertulifera.</i>
<i>fissispina.</i>	<i>troscheli.</i>
<i>forbesi.</i>	<i>varia.</i>
<i>fulgens.</i>	

Incertæ sedis.

*mitis.*

### ii. DIPLACANTHIDA.

<i>alba.</i>	<i>lurida.</i>
<i>amurensis.</i>	<i>mollis.</i>
<i>bootes.</i>	<i>neglecta.</i>
<i>brandti.</i>	<i>nuda.</i>
<i>clavatum.</i>	<i>obtusispinosa.</i>
<i>cribraria.</i>	<i>ochotensis.</i>
<i>epichlora.</i>	<i>*rubens.</i>
<i>fulva (?)</i>	<i>sinusoida.</i>
<i>germaini (?)</i>	<i>spectabilis.</i>
<i>grænlandica<sup>1</sup>.</i>	<i>stellionura.</i>
<i>hispida.</i>	<i>sulcifera.</i>
<i>japonica.</i>	<i>*tenera.</i>
<i>littoralis.</i>	<i>vulgaris.</i>

Sp. incertæ sedis.

*fungifera.*

<sup>1</sup> Sometimes one of the pair of spines disappears from certain plates.

## iii. POLYACANTHIDA.

*panopla.*

The number of species in the first two groups of the Pentactinida is still so large that we must now attempt to find some means by which they may be still further subdivided.

Among a certain number of forms we find a special modification of some of the dorsal spines, which come to form an encircling fringe around the madreporic plate. In some species these spines are obvious enough; but I know of no author except Prof. Verrill who has directed any attention to them<sup>1</sup>, or attached any importance to their presence. As, however, I will show in detail further on, I cannot give in my adhesion to the validity of the genus *Lep-tasterias*, even when the proposition comes from so deservedly honoured and distinguished a naturalist. I doubt, in fine, whether they can be used as any thing more than a convenient separation-character in a genus where specific characters are so rare.

The species, then, which are provided with a circlet of spines round their madreporic plate may be distinguished as the *Echinoplacida*; such among the Diplacanthid Pentactinida are:—

*A. fulva* (with 18 spines).

*A. germaini* (with spines indistinct).

*A. lurida* (with 12 spines).

*A. nuda* (with spines irregularly distributed).

*A. obtusispinosa* (with 12 spines).

*A. sinusoida* (with spines irregularly distributed).

*A. spectabilis* (with 18 spines).

It is curious to observe that, as yet, the echinoplacid condition has not been noted as obtaining among the Monacanthid Pentactinida; among the Polyactinida the echinoplacid condition seems only to have been observed in the diplacanthid monoplacid form *acervata*, where there are said to be 13 spines around the madreporic plate.

In a description of the species *A. brandti*, which I lately communicated to the Society<sup>2</sup>, I have directed attention to the mode of arrangement of the greater number of the intermediate spines on special local modifications of the integument, which may be known as special plates. This arrangement should be familiar enough; for it is to be found in *A. tenuispina*, and is represented in the figure of that species given by Müller and Troschel ('System der Aster.' pl. i. fig. 1 b). The forms in which the spines thus rise from special plates may be distinguished as *autacanthid*.

In such a group we should find:—the Polyactinid *meridionalis*, *perrieri*, *tenuispina*, and (probably) *scabra*; and the Pentactinid Diplacanthid *brandti* and *neglecta*.

When the spines retain the simpler disposition which is seen in *A. rubens* and most of the better known forms, we may speak of the arrangement as being *typacanthid*.

<sup>1</sup> Of course such a naturalist as Philippi does not fail to note their presence.

<sup>2</sup> P. Z. S. 1881, p. 91.

The more we get into subdivisions the more unsatisfactory will, it is obvious, our characters get; and I fully recognize the difficulty, nay, impossibility, of naturalists having any thing like a unanimous opinion on the value of the groups now to be proposed. I give them, however, for what they are worth. They depend on the characters of the spines on the abactinal surface; and, according as these are simple or rare, blunted or acute, we may get divisions to which we may apply the epithets of *simplices*, *rarispinosæ*, *obtusispinosæ*, or *acutispinosæ*. This unsatisfactory method of division is, at present, the only one which can be suggested for the Monacanthid Pentactinida.

When applied in tabular form, we get the following as the result of our attempt:—

Genus ASTERIAS.

Div. I. HETERACTINIDA.

Species with, as a rule, more than five rays.

A. POLYPLACIDA.

Species with more than one madreporic plate.

i. MONACANTHIDA.

Adambulacral spines in a single longitudinal row.

α. ECHINOPLACIDA.

Madreporic plate with a circlet of spines.

0.

β. ANECHINOPLACIDA.

No circlet of spines to madreporic plate.

(i.) *Autacanthida*. Dorsal spines placed on special plates.

*A. tenuispina*.

(ii.) *Typacanthida*. Dorsal spines not placed on special plates.

*A. calamaria*.

ii. DIPLACANTHIDA.

Ambulacral spines in a double row.

α. ECHINOPLACIDA.

0.

β. ANECHINOPLACIDA.

(i.) *Autacanthida*.

0.

(ii.) *Typacanthida*.

*A. acutispina*.

*A. polyplax*.

*A. capensis*.

## B. MONOPLACIDA.

Species with only one madreporic plate.

## i. MONACANTHIDA.

## a. ECHINOPLACIDA.

0.

 $\beta$ . ANECHINOPLACIDA.

## (i.) Autacanthida.

*A. perrieri*.

## (ii.) Typacanthida.

<i>A. gelatinosa.</i>	<i>A. rodolphi.</i>
<i>A. gemmifera.</i>	[? <i>A. equalis</i> .]
<i>A. katherinæ.</i>	

## ii. DIPLACANTHIDA.

## a. ECHINOPLACIDA.

*A. acervata.* $\beta$ . ANECHINOPLACIDA.

## (i.) Autacanthida.

<i>A. meridionalis.</i>	(?) <i>A. scabra.</i>
<i>A. polaris.</i>	

## (ii.) Typacanthida.

<i>A. borealis.</i>	<i>A. perrieri.</i>
<i>A. douglasi</i> (?)	<i>A. studeri.</i>
<i>A. hexactis</i> (!)	<i>A. vancouveri.</i>

## Div. II. PENTACTINIDA.

Species with five rays only.

## A. POLYPLACIDA.

0.

## B. MONOPLACIDA.

## i. DIPLACANTHIDA.

## a. ECHINOPLACIDA.

<i>A. fulva.</i>	<i>A. obtusispinosa.</i>
<i>A. germaini.</i>	<i>A. sinusoida.</i>
<i>A. lurida.</i>	<i>A. spectabilis.</i>
<i>A. nuda.</i>	<i>A. sulcifera.</i>

 $\beta$ . ANECHINOPLACIDA.

## (i.) Autacanthida.

<i>A. brandti.</i>	<i>A. neglecta.</i>
<i>A. grandlandica.</i>	<i>A. stellionura.</i>



## (ii.) Typacanthida.

i. *Simplices*. Dorsal spines arranged on the type of *A. rubens*.*A. amurensis*.*A. rubens*.*A. ochotensis*.*A. vulgaris*.ii. *Rarispinosæ*. Dorsal spines rare (as in *A. glacialis*).*A. alba*.iii. *Retusispinosæ*. Spines blunted and short.*A. epichlora*.iv. *Acutispinosæ*. Spines pointed and sharp.*A. cribraria*.*A. littoralis*.*A. japonica*.*A. tenera*.

## ii. MONACANTHIDA.

## a. ECHINOPLACIDA.

0.

## β. ANECHINOPLACIDA.

## (i.) Autacanthida.

0.

## ii. Typacanthida.

i. *Simplices*.*A. cunninghami*.? *A. luetheni*.*A. forbesi*.ii. *Rarispinosæ*.*A. africana*.*A. rarispina*.*A. glacialis*.*A. webbiana*.*A. paucispina*.(? *A. fissispina*.)iii. *Retusispinosæ*.*A. antarctica*.[? *A. capitata*.*A. troscheli*.? *A. conferta*.]iv. *Acutispinosæ*.

0.

## C. POLYACANTHIDA.

## a. ECHINOPLACIDA.

*A. panopla*.

## MODE OF FORMULATING RESULTS.

By the use of the following symbols one may see at a glance which of these characters are possessed by any given species, by assigning the following symbols to the different characters:—

1 = monacanthid ; 2 = diplacanthid ; 3 = polyacanthid ;

*m* = monoplacid ; *p* = polyplacid ;

$e$ =echinoplacid;  $a$ =anechinoplacid;  
 $a'$ =autacanthid;  $t$ =typacanthid;  $s$ =simplicis;  
 $r$ =rarispinosæ;  $r'$ =retusispinosæ;  $c$ =acutispinosæ.

Thus, the formula for *A. rubens* is  $2\ atr$ ; for *A. rubens* is diplacanthid, anechinoplacid, typacanthid, with simple dorsal spines.

To distinguish between the Pentactinida and the Heteractinida I propose to place the formula for the latter under the mathematical sign of a square root; thus  $\sqrt{1\ p}$  is sufficient to distinguish *A. calamaria* as a monacanthid polyplacid heteractinid form. If we know, as we do in this case, further details, we may write the formula  $\sqrt{1\ paa'}$ ; or, in other words, in addition, *A. calamaria* has no spines round its madreporic plate, and the dorsal spines are placed on special plates.

To take two other examples:—

*A. epichlora* =  $2\ atr'$ , or is diplacanthid, anechinoplacid, typacanthid, and retusispinose (or has the spines blunted and short); the absence of the root sign shows it to be pentactinid.

For *A. gelatinosa* we have  $\sqrt{1\ m}$ ; or it is monacanthid and monoplacid, while the root-sign shows it to be heteractinid; as, also, it is anechinoplacid and typacanthid, we may write its full formula  $\sqrt{1\ mat.}$

1. acervata	= $\sqrt{2\ me.}$	30. gelatinosa	= $\sqrt{1\ mat.}$
2. acutispina	= $\sqrt{2\ pat.}$	31. gemmifer	= $\sqrt{1\ mat.}$
3. æqualis	= $\sqrt{1\ mat.}$ (?)	32. germaini	= $re.$
4. africana	= $1\ atr.$	33. glacialis	= $1\ atr.$
5. alba	= $2\ atr.$	34. græcilandica	= $2\ ad.$
6. anurensis	= $2\ ats.$	35. hexactis	= $\sqrt{2\ mat.}$
7. antarctica	= $1\ atr'.$	36. hispida	= $1\ ats.$
8. borbonica	= $1.$	37. ianthina.	
9. borealis	= $\sqrt{2\ mat.}$	38. japonica	= $2\ ate.$
10. brachiata	= $1.$	39. katherina	= $\sqrt{1\ mat.}$
11. brandti	= $2\ aa'.$	40. linekii	= $1\ atr.$
12. brevispina	= $1.$	41. littoralis	= $2\ ate.$
13. calamaria	= $\sqrt{1\ put.}$	42. luelkeni	= $1\ ats$ (?)
14. cantschatica.		43. lurida	= $2\ e.$
15. capensis	= $\sqrt{2\ pat.}$	44. margaritifera	= $1.$
16. capitata	= $1\ atr$ (?)	45. meridionalis	= $\sqrt{2\ mau'}$
17. clavatum	= $2\ r.$	46. mexicana	= $1.$
18. compita	= $1.$	47. mitis.	
19. conferta	= $1\ atr'$ (?)	48. mollis	= $2.$
20. cribraria	= $2\ ate.$	49. muelleri	= $1\ atr.$
21. cunninghami	= $1\ ats.$	50. neglecta	= $2\ ad.$
22. disticha.		51. nuda	= $2\ e.$
23. douglasi	= $2\ \sqrt{mat.}$	52. obtusispinosa	= $2\ e.$
24. epichlora	= $2\ atr'.$	53. ochotensis	= $2\ ats.$
25. fissispina	= $1\ atr$ (?)	54. ochracea	= $1\ atr'.$
26. forbesi	= $1\ ats.$	55. panopla	= $3\ e'.$
27. fulgens	= $1.$	56. paucispina	= $1\ atr.$
28. fulva	= $2\ e.$	57. pectinata.	
29. fungifera	= $2.$	58. perrieri	= $\sqrt{1\ mau.}$

59. polaris.	= $\sqrt{2}$ <i>maad'</i> .	69. spectabilis	= 2 <i>e</i> .
60. polyplax	= $\sqrt{2}$ <i>pat</i> .	70. stellionura	= 2 <i>ad'</i> .
61. rarispinia	= 1 <i>atr</i> .	71. studeri	= $\sqrt{2}$ <i>mat</i> .
62. rodolphi	= $\sqrt{1}$ <i>mat</i> .	72. sulcifera	= 2 <i>e</i> .
63. rubens	= 2 <i>ats</i> .	73. tenora	= 2 <i>atc</i> .
64. rugispina	= 1 <i>atr'</i> .	74. tenuispina	= $\sqrt{1}$ <i>puad'</i> .
65. rupicola (?)	= 1 <i>atr</i> .	75. troscheli	= 1 <i>atr'</i> .
66. senbra	= $\sqrt{2}$ <i>maad'</i> . (?)	76. vancouveri	= $\sqrt{2}$ <i>mat</i> .
67. sertulifera	= 1.	77. varia	= 1.
68. sinusoida	= 2 <i>e</i> .	78. vulgaris	= 2 <i>ats</i> *.

*Characters of Leptasterias, Verrill.*—It may well be a fair question to ask, why, when a genus contains so many species, I do not avail myself of Prof. Verrill's generic division of *Leptasterias*. The answer falls under two heads:—First, the leading distinctive character is the comparatively large size of the papulæ; but this is only a step from what we find in species that are still retained in the genus *Asterias* proper; the presence of a circle of spines around the madreporic plate is certainly not a characteristic of the Leptasteriads alone, as must have been abundantly shown in the earlier part of this paper; while, further, all specimens of *A. muelleri* are most certainly not echinoplacid. In the second place, the presence of a large number of species in a genus cannot, of itself, be any reason at all for establishing a number of insufficiently distinct genera. *Queri libet de natura: ita est.* For the purposes of descriptive systematic zoology it may be, and is, necessary to break up an enormous genus into smaller convenient working groups; but it is better not to give to such groups titles which have a precise technical value.

For the present, at any rate, I think we may retain Gray's genus *Uniophora*.

#### CHARACTERS OF THE SPECIES OF *Asterias* FOUND IN THE BRITISH SEAS.

My attention was more particularly directed to this subject by the difficulty which I had in coming to any distinct idea as to the characters of *A. hispidia*. Unable to distinguish any forms as such in the cabinets of the British Museum, I naturally turned for assistance to the well-known naturalist whose acquaintance with the marine fauna of our own coasts is only equalled by his kindness and courtesy. To the Rev. A. M. Norman, then, the national collection owes some specimens of what he distinguishes as *A. hispidia*.

In addition to the specimens of *A. hispidia* which he presented to the Museum, Mr. Norman sent for my inspection several other series of specimens from various localities. In the letter with which he honoured me, Mr. Norman hinted that *A. hispidia* and *A. violacea* should now be united, he expresses some little doubt as to the accuracy of the determination of the specimens collected in the British

\* [To make this paper as complete as may be, I add a reference to the species (*A. spitsbergensis*) lately described by Messrs. Danielssen and Koren. It appears to be pentactinid, polycanthid, and echinoplacid. See Ann. Nat. Hist. (5) viii. p. 66.—F. J. B. July 1st, 1881.]

seas as being the *A. muelleri* of Sars, and he concludes by directing my attention to a remarkable and rare specimen taken at Seaham.

The questions, then, which are proposed to us are :—

- (1) The characters of *A. hispida*.
- (2) Is *A. muelleri*, Sars, found on our shores?
- (3) Is *A. muelleri* really distinct from *A. glacialis*?
- (4) Have representatives of any other species, described or undescribed, been found in our seas?

(1) *The Characters of A. hispida.*

With regard to this species, Edward Forbes writes:—"It may easily be passed over as the young of one of the more common species; but it is very distinct." He gives as the specific character, "Rays short, rounded, spinous. Avenues ovate." It is, however, obvious that, without some further qualification, the shortness of the rays is a character of no significance whatever; the rays in young Asterids are always proportionally shorter than in older forms; as Sars remarks, in describing *A. muelleri*<sup>1</sup>, "Bei jüngeren sind, wie bei allen Seesternen, die Arme verhältnissig kürzer."

What, therefore, we have to know is whether there is any difference, and, if so, what, between *A. hispida* and *A. rubens* in this respect.

The greater and the lesser radii may, as usual, be distinguished by the symbols *R* and *r*; the measurements are made in millimetres.

*A. rubens.*

Series *a*. "Seaham, Mr. Hodge."

Breadth of ray.

- |           |   |     |
|-----------|---|-----|
| i. ....   | $R=11\cdot5$ , $r=3$ , or $R=3\cdot83\ r$ . | 3·2 |
| ii. ....  | $R=9\cdot5$ , $r=3$ , or $R=3\cdot16\ r$ .  | 2·8 |
| iii. .... | $R=7\cdot0$ , $r=2$ , or $R=3\cdot50\ r$ .  | 2·0 |

Series *β*. "? *A. rubens*. St. Magnus Bay, Shetland; deep water."

Breadth of ray.

- |           |  |     |
|-----------|--|-----|
| i. ....   | $R=11\cdot0$ , $r=4\cdot0$ , or $R=3\cdot6\ r$ . | 3·0 |
| ii. ....  | $R=9\cdot5$ , $r=3\cdot0$ , or $R=3\cdot16\ r$ . | 3·1 |
| iii. .... | $R=8\cdot2$ , $r=2\cdot6$ , or $R=3\cdot15\ r$ . | 2·5 |
| iv. ....  | $R=6\cdot5$ , $r=2\cdot0$ , or $R=3\cdot25\ r$ . | 2·0 |

*A. hispida.*

Series *a*. "Oban, Mr. D. Robertson."

Breadth of ray.

- |           |  |     |
|-----------|--|-----|
| i. ....   | $R=19\cdot5$ , $r=8\cdot0$ , or $R=2\cdot437\ r$ . | 9·0 |
| ii. ....  | $R=15\cdot0$ , $r=6\cdot2$ , or $R=2\cdot419\ r$ . | 6·2 |
| iii. .... | $R=12\cdot0$ , $r=6\cdot0$ , or $R=2\cdot0\ r$ .   | 5·0 |
| iv. ....  | $R=11\cdot0$ , $r=4\cdot2$ , or $R=2\cdot619\ r$ . | 5·0 |

Series *β*. Outer Skerries, Shetland.

Breadth of ray.

- |           |  |     |
|-----------|--|-----|
| i. ....   | $R=17\cdot0$ , $r=5\cdot0$ , or $R=3\cdot4\ r$ . | 6·0 |
| ii. ....  | $R=15\cdot5$ , $r=4\cdot5$ , or $R=3\cdot4\ r$ . | 4·5 |
| iii. .... | $R=12\cdot0$ , $r=4\cdot0$ , or $R=3\cdot0\ r$ . | 4·5 |

<sup>1</sup> Faun. litt. Norv. p. 56.

Series $\gamma$ . Outer Skerries, Scotland.				Breadth of ray.
i. . . .	$R=10\cdot5$ ,	$r=3\cdot0$ ,	or $R=3\cdot5 r$ .	3·5
ii. . . .	$R=10\cdot0$ ,	$r=3\cdot0$ ,	or $R=3\cdot3 r$ .	3·5
iii. . . .	$R=9\cdot5$ ,	$r=3\cdot0$ ,	or $R=3\cdot16 r$ .	4·5
iv. . . .	$R=9\cdot0$ ,	$r=3\cdot0$ ,	or $R=3\cdot0 r$ .	3·7
v. . . .	$R=7\cdot5$ ,	$r=2\cdot5$ ,	or $R=3\cdot0 r$ .	3·0

Arranging these numbers in order, we find for *A. rubens*

3·83, 3·6, 3·5, 3·25, 3·16, 3·16, 3·15;

and for *A. hispida*

3·5, 3·4, 3·4, 3·3, 3·16, 3·0, 2·619, 2·437, 2·419, 2·0.

For *A. rubens*, then, the proportion of  $R$  to  $r$  does not fall below 3·15; and the specimen in which that obtains is comparatively young, and has  $R$  only equal to 8·2 millim.; in *A. hispida* it may fall as low as 2, and that in a specimen of moderate size, or with a long radius of 12 millim.

If we take only series  $\alpha$  of *A. hispida* we find a marked shortness of ray; but, unfortunately, that series is so far aberrant that the smallest specimens have  $R$  proportionally the longest. If, on the other hand, we take series  $\gamma$  (and that is the series which Mr. Norman has presented to the British Museum), we find a set of proportions which can hardly be said to compare unfairly with series  $\beta$  of *A. rubens*.

If now we take a series of older specimens of *A. rubens*, we may be led to certain conclusions; the set taken, though not in any way specially selected, is very favourable:—

i. . . .	$R=65$ ,	$r=13\cdot5$ ,	or $R=4\cdot81 r$ .
ii. . . .	$R=60$ ,	$r=13\cdot0$ ,	or $R=4\cdot61 r$ .
iii. . . .	$R=56$ ,	$r=13\cdot0$ ,	or $R=4\cdot60 r$ .
iv. . . .	$R=46$ ,	$r=12\cdot0$ ,	or $R=3\cdot83 r$ .

We are therefore, as it seems to me, led to the conclusion that for *A. rubens* there is a gradual increase, during growth, in the length of  $R$  as compared with  $r$ .

In some cases, as with series  $\gamma$ , sets of specimens of *A. hispida* may well fall into the series; but, on the other hand, they may (as does series  $\alpha$ ) exhibit so great a variation as to lead to the suspicion that they must have been subjected to more or less abnormal conditions. And, finally, we cannot with safety appeal to the shorter rays of *A. hispida* as a definite and constant mark of specific differentiation.

The next specific character given by Forbes is "rays rounded;" but the same term is applied to *A. rubens*; then we have "spinous" for *A. hispida*, and "very spiny" for *A. rubens*.

The last character, and one which is regarded as being a good mark of distinction in this genus, is the form of the "ambulacral avenues;" they are lanceolate in *A. rubens*, and "elongate-ovate" in *A. hispida*. As it is obvious that the form of the ambulacra will depend not a little on the width of the rays at their base, I proceed

to examine the proportion between the greater radius and the width of the base of the arm. The absolute measurements have already been given; these, when worked out, give the following proportions:—

*A. hispida*—2.1, 2.16, 2.18, 2.20, 2.4, 2.419, 2.5, 2.6, 2.83, 2.85, 3.0, 3.4;

*A. rubens*—3.0, 3.06, 3.25, 3.28, 3.50, 3.6.

It is, then, so far clear that the base of the arms is wider in *A. hispida* than in *A. rubens* for specimens of, or about, the same size.

When we measure larger specimens of the commoner species, we find the proportional value of the base of the arm to be 2.62, 2.86, 3.45, and 3.76.

And this series falls in as well with *A. hispida* as with *A. rubens*; there is, however, this essential difference—that, in the former, *R* varies between 19.5 and 7.5 millim., while in the case of *A. rubens* *R* has the minimum value of 42 millim., and a maximum value of 64 millim.

After all, however, it is hardly necessary to raise the question of proportions; for *A. hispida* would seem to have never more than one row of adambulacral spines, whereas *A. rubens* has frequently two; and, in the second place, there are absent from it the larger pincer-formed “pedicellariæ.”

Now arises an important and difficult question,—Is the absence of these pedicellariæ any thing more than a specific characteristic? In other words, should it not be regarded as a mark of generic difference. Sufficient information is not yet at hand to justify any final decision; but I would suggest that the question be kept before the minds of naturalists who busy themselves with these difficult forms. I am myself inclined to believe that there is only a tendency to their complete disappearance, and that the difference is purely specific.

On the other hand, we know far too little as to the conditions of existence under which these creatures live. Is it not possible that, after all, *A. hispida* is but a pure variety, or a local race, or a form stunted by living under disadvantageous conditions<sup>1</sup>. It is, indeed, possible; but, at present, the weight of evidence is in favour of Forbes’s original position, that *A. hispida* is a distinct species.

## (2) Characters of *A. muelleri*, Sars.

The collection of the British Museum contains two specimens bearing the “étiquette” of *A. muelleri*. One, in spirit, was named by Dr. Lütken, and it may therefore be regarded as a good, though, of course, not by any means necessarily a “typical” specimen of the species; the other, which is dried, bears a label “*Asterocanthion* (sic) *mülleri* :” it was “purchased of Brandt;” but there is no evidence as to who named it.

The specimen named by Dr. Lütken has *R* equal to 13 millim., while *r*=3, and the breadth of the arms at their base is 3.5 millim.

<sup>1</sup> Compare especially the interesting remarks of Prof. Rupert Jones in his very philosophical paper on Variation in the Foraminifera (Monthly Mier. Journ., 1876 pp. 61-92)

On comparing this with one of Mr. Norman's specimens, in which  $R=16$ ,  $r=3$ , we are at once struck by the greater development of spines on the abactinal surface of the latter, where it is possible to make out five very distinct rows of spines, while in the former only three are to be accurately distinguished. In consequence of this difference the specimens do not, as may be imagined, present any very close resemblance. When we refer to the original description of Sars we find some explanation; for he says, "Auf dem Rücken derselben 3-5 Reihen, von denen 3 deutlich, die 2 anderen weniger deutlich oder häufig unvollständig sind." Though no two specimens in the set of seven which were taken off Shetland differ from one another so markedly as do the two just referred to, yet they differ sufficiently to show that the specimens of the species which are found in the British Seas, just as much as those found off the Scandinavian coasts, do vary, in this particular, within very wide limits. The spines on Mr. Norman's specimens seem to be sharper and rather longer than those on the specimen named by Dr. Lütken. The proportions, and the resulting general appearance, are very much the same; and I can see no reason why the specimens should not all be regarded as members of the same species.

The above discussion contains an answer to the third question; for in demonstrating the characters of *A. muelleri* it proves the distinctness of that species from *A. glacialis*.

The consideration of exceptional forms from the British seas may well be postponed for further information and a larger series of specimens.

In here describing some forms under new names I am taking the course which, after careful consideration, seems to me to be at present that which is best adapted for the advancement of science. The exact limits of the species of this genus can only be defined by enormous collections.

#### DESCRIPTIONS OF NEW OR RARE SPECIES.

##### ASTERIAS PHILIPPII, sp. nov. (Plate XLVII. figs. 1, 1a.)

It is necessary to make this new species for two specimens preserved in alcohol, and forming portion of the old Haslar collection; they were collected by J. O. Goodridge, Esq., Surgeon R.N., and are stated to have come from "South America."

General formula  $\sqrt{2maa'}$ .

Rays six, rather stout; disk moderate; adambulacral spines in two rows, madreporic plate single, anechinoplacid, lateral and actinal spines autacanthid—general formula  $\sqrt{2maa'}$ . The adambulacral spines present a remarkable appearance, owing to their small size, their delicacy, and their close packing; in addition to this the integument around them is raised up into processes almost as long as the spines, and thus increases the appearance of crowding. A well-marked groove separates these from the outer spines, of which there are two rows on the actinal surface, while a third occupies the side of the ray. All these spines, the best-developed of which may be as

much as 3 millim. long, are autacanthid; and their bases are surrounded by shorter spines or papilliform processes of the integument. Towards the tip of the arm the innermost row disappears. The large space between the outermost or third row, or that which runs along the lower portion of the side of the arm on either side, presents in its lower portion irregular and feebly-developed spines; along the middle line of the back of the arm there runs an irregular row of spines or clumps of spines; and on either side of this there is a still more irregular row. The middle row is continued onto the disk, the centre of which is occupied by a clump of five autacanthid, more or less blunt and rounded tubercle-like spinous processes; at an equal distance from this central clump, and at the base of each ray, there is another clump, a little more irregular in character; an accessory clump may be developed near the central one. The same clump-arrangement is exhibited all along the back of the arm, but varies within very wide limits, and only one spine may be developed. The whole integument is thick and granular, the madreporic body more or less prominent, pedicellariæ rather rare. General colour light orange-yellow (after immersion in spirit for at least twenty-five years).  $R=90$ ,  $r=23$ ;  $R=101$ ,  $r=25$ .

So far as we may judge from two specimens, the species will be found to exhibit considerable variation.

It has the same general formula as has *A. meridionalis*, and, so far as one may judge from the diagnosis, *A. scabra*; from the former it may be at once distinguished by the less regular repartition of the spines of the abactinal surface, and by the complete absence of any bare interbranchial space on the actinal surface of the disk. I am quite unable to form any conception of *A. scabra* from Capt. Hutton's description.

#### ASTERIAS INERMIS, n. sp. (Plate XLVII. figs. 2, 2a.)

This species is also founded on a specimen collected by Mr. Goodridge, and bears Ecuador as its locality.

#### General formula 2aa'.

It is remarkable for the very feeble development of spines on its abactinal surface, where, though all autacanthid, they form the merest projections.

Rays five, broad at base, tapering rapidly but regularly; two rows of adambulacral spines; madreporic plate anechinoplaeid, obscure, quite at the margin of the disk; spines of actinal surface short, slender, delicate and autacanthid. Of all the spines the longest are the adambulacral; but they do not exceed 2 millim. in length. Beyond these there is a row of spines, generally one only on each plate; in the next outer row the spines are rather sharper and longer, and there are sometimes two on one plate. Beyond this the rows begin to get somewhat indistinct, and the spines still shorter. Plates carrying very short, white, tubercle-like spines are closely packed, without any apparent order, over the whole of the abactinal surface.



General coloration (after at least twenty-five years' immersion in spirit) white, the suckers yellowish.  $R=41$ ,  $r=13$ . Arms 13.5 millim. broad at base, 3 millim. at tip of arm.

*ASTERIAS VERRILLI*, n. sp. (Plate XLVII. figs. 3, 3a.)

General formula *latr.*

Arms five, stout; disk large; ambulacral grooves very wide, adambulacral spines in a single row, madreporic plate anechinoplacid, and almost exactly midway between the centre and the margin of the disk, small and obscure; typacanthid spines on abactinal surface rare, irregular, short, stout, with knobbed ends, more numerous in younger specimens. Respiratory papulæ numerous, and in the adult arranged in distinct groups. Clumps of two, three, or four spines, proportionally longer in the young forms, occupy the margins of the actinal surface of the arms; they are longest and most distinct nearest the disk. The side is separated from the dorsal surface of the arm by a somewhat obscure and not closely packed row of short stout spines.  $R=48$ ,  $r=16$  ∴  $R=3r$ ; breadth of arms at base = 14 millim., near tip 4.5 millim.;  $R=28.5$ ,  $r=7.5$ , or  $R=3.8r$ .

If the specimens have been correctly referred to one species, the spines on the dorsal surface are rather more distinct in the smaller forms, the row of spines running along the upper edge of the side of the arm is more distinct, and the general appearance of the specimens is somewhat different, owing to the greater length and number of the spines on them.

The largest specimen, which has been for about forty years in spirit, and the companion specimen are of a brownish coloration. They were collected by the "Antarctic Expedition" in St. Martin's Cove; the three smaller specimens, which were presented to the Museum in 1868, were collected by Dr. Cunningham in "Peckett Harbour and Gregory Bay," and off Elizabeth Island, and are cream-white.

*ASTERIAS SPIRABILIS*, n. sp. (Plate XLVIII. fig. 4.)

This species, which was collected in 1842 off the Falkland Islands, is remarkable for the very great development of the membranous respiratory processes.

General formula *latr.*

Arms five, rather long, thick, tapering regularly, not wide at the base; disk comparatively small. Adambulacral spines in a single row; madreporic plate small, obscure, about midway between the centre and the edge of the disk. The whole of the abactinal surface and the sides of the rays are quite soft, owing to the great development of the membranous papulæ, which completely cover the disk and arms and almost totally obscure the tubercles of the back. The rather closely packed, not specially stout, adambulacral spines are separated from those that lie beyond them by a fringing line of large respiratory processes. The sides of the actinal surface are

occupied by short, frequently peg-shaped spines, which are generally set in transverse rows of three. Beyond and above this in the adult there are no indications of any rows of spines.

The specimen from which the above description has been drawn up, and which is presumed to be adult, has  $R$  equal to 60, and  $r$  to 13; the arms are 15 millim. wide at the base, 4.5 near tip of arm; one arm has been lost.

General coloration (after 40 years in spirit) light brown.

Some much smaller specimens ( $R=23$ ,  $r=7.5$ ;  $R=18$ ,  $r=8$ ) from the same locality and collector, appear to belong to the same species: the development of the respiratory processes, though exceedingly well marked, has not attained to such an extraordinary pitch as in the more adult specimen; and, as a consequence, the tubercular spines on the abactinal surface and at the sides of the arm are more apparent. The processes, owing to some difference in refraction, and not because of the development of pigment, exhibit the most curious similarity to bivalved pedicellariæ. Spaces bare of spines are found at the angles of the disk on the actinal surface.

Two specimens rather larger ( $R=34$ ,  $r=9$ ), which have a very close resemblance to the others in the number and arrangement of the adambulacral spines and the arrangement of the respiratory processes, differ from them in the well-marked development of rounded tubercle-like spines over the whole of the abactinal surface and in the absence of the bare space at the angle of the disk. They may for the present, at any rate, be regarded as varieties; they are from the Falkland Islands also, but are of a rather deeper colour.

#### ASTERIAS ROLLESTONI, n. sp. (Plate XLVIII. figs. 5, 5a.)

##### General formula 2ate.

Arms five, rather long, tapering gradually; disk of moderate size; adambulacral spines in a double row, those of the inner less numerous than those in the outer. Madreporic plate placed about half-way between the centre and the edge of the disk, anechinoplacid, very distinct, with a well-marked groove around it. The whole of the abactinal surface rough with irregularly disposed typacanthid spines, of which a rather obscure wavy line can be detected along the middle line of each ray.

The adambulacral spines are stouter in the outer than in the inner row, but even there are not at all thick; they are flattened, with broad, not pointed, free ends. The spines in the two rows beyond these are remarkably broad at their free end; and the character is more striking than in *A. japonica* of Stimpson; they are thickly beset with pedicellariæ. Two rows of much smaller spines are placed at the sides of the abactinal surface. The glistening white abactinal tubercles diminish somewhat in size from the centre of the disk towards the apex of the arms; the respiratory processes are not collected into groups, but are distributed over the whole surface.

$R=34$ ,  $r=9.5$ . Breadth of arms at base 11 millim., near tip 2.5. Madreporic plate 3 millim. across.

Colour of the single specimen yellowish white, the suckers rather darker. Presented in 1873, by Dr. Gwyn Jeffreys; collected by Capt. H. C. St. John, R.N., in the Japanese seas.

ASTERIAS JAPONICA, Stimpson. (Plate XLVIII. figs. 6, 6a, 6b.)

As the description of this species, if ever published, must be very difficult of access, and as it seems to be unknown to the bibliographers, I add the following notes, which will, I hope, enable students to recognize it when they find it. I know of its existence only from the presence in the British-Museum collection of a dried specimen presented in 1861 by the Smithsonian Institution, and bearing their label "*Asterias japonica*, Stm., I. of Jesso."

General formula 2atc.

Arms five, elongated, narrow, disk small; adambulacral spines in two rows; madreporic plate small, rather obscure, anechinoplacid, close to the edge of the disk; both the abactinal and actinal surfaces are rough with short slender spines, closely packed. The spines in the row just outside the adambulacrals are blunter than any of the rest; their free end is broader than their base; the spines of the next row are also rather blunt; beyond this there are two rows of more slender spines; and beyond this fourth row there is a well-marked line, in which lie the respiratory pores. The spines which extend beyond this over the whole surface of the arm, and form something like six rows on either side of its middle line, may be set singly or in small clumps; they are all short, slender, and rather sharp, and are richly provided with pedicellariæ. Respiratory pores occupy the interspaces on the surface of the arm.

A distinct median dorsal line is apparent on some, though not on all, of the arms of the specimen under description.

$R=55$ ,  $r=7.5$ . Breadth of arms at base 10 millim., close to tip 3 millim.

Colour of dried specimen umber-brown; the dried ambulacral suckers black.

EXPLANATION OF THE PLATES.

PLATE XLVII.

Fig. 1. *Asterias philippii*, n. sp., abactinal surface, nat. size.

1 a. Actinal surface, nat. size.

2. *A. incermis*, n. sp., general view, nat. size.

2 a. Actinal surface of ray,  $\times 1\frac{1}{2}$ .

3. *A. verrilli*, n. sp., general view of actinal surface.

3 a. Part of abactinal surface,  $\times 2$ .

PLATE XLVIII.

4. *A. spirabilis*, n. sp., actinal surface of ray,  $\times 1\frac{1}{2}$ .

5. *A. rollestoni*, n. sp., actinal surface,  $\times 2$ .

5 a. *A. rollestoni*, abactinal surface,  $\times 2$ .

6. *A. japonica*, Stm., abactinal surface,  $\times 1\frac{1}{2}$ .

6 a. *A. japonica*, actinal surface,  $\times 1\frac{1}{2}$ .

6 b. *A. japonica*; some of the spines of the abactinal surface, further magnified.

2. Additional Observations on the Anatomy of the Spotted Hyæna. By M. WATSON, M.D., F.Z.S., Professor of Anatomy, the Owens College, Manchester.

[Received March 21, 1881.]

(Plate XLIX.)

On former occasions I have laid before this Society the results of observations on the anatomy of the male<sup>1</sup> and female<sup>2</sup> organs of *Hyæna crocuta*; and having, through the kindness of Mr. Selater, had an opportunity of again submitting to anatomical examination the carcasses of two additional specimens of this remarkable animal which died in the menagerie of the Society during last summer, I desire to record some supplementary observations made at that time. The specimens referred to were both full-grown and of large size. One was a female, which had on several occasions given birth to young while in the Society's collection, whilst the other was a male. An examination of the genital organs of this female whilst perfectly fresh, served to explain several difficulties to which I drew attention in my previous communication with regard to the alteration which these organs undergo during the process of parturition. The organs which I formerly described being those of a virgin, I now lay before the Society the results of a comparative examination of these with the organs of a mature female.

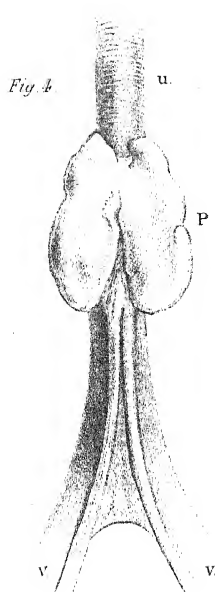
*Female.*

With respect to the form and arrangement of the ovaries, Fallopian tubes, and uterus, I have nothing to add to what has already been stated in the paper referred to, beyond the fact that on slitting open the body of the uterus, I could distinguish about the middle in length of that organ two *very slightly* projecting folds of mucous membrane, which I failed to recognize in my first specimen, and which ought possibly to be regarded as indicating the position of the os uteri. If this view be correct, then the lower half of the corpus uteri of my former paper must be regarded as the morphological equivalent of the vagina. At the same time the very small size of these folds, the absence of any structural difference in character of the mucous membrane lining the two portions of the canal, and the similarity in thickness of the muscular coat of both throw doubt upon this interpretation—a doubt which can only be satisfactorily dispelled by an examination of the parts in a pregnant female, and the consequent determination of the position of the young *in utero*.

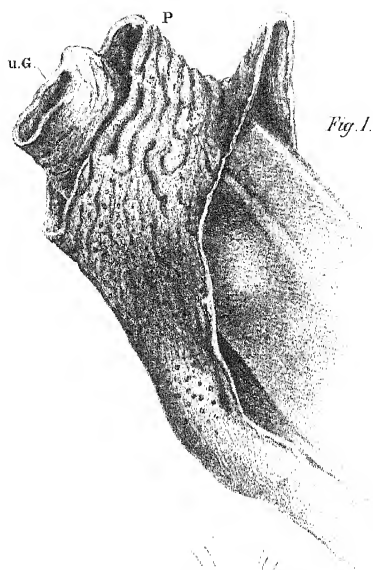
In the second female dissected the urinogenital canal differed much in several particulars from that of the virgin. In the latter the extremity of the clitoris is perforated by "a single canal of so small a size, that one is at first sight inclined to believe that

<sup>1</sup> P. Z. S. 1878, p. 416.

<sup>2</sup> P. Z. S. 1877, p. 369.

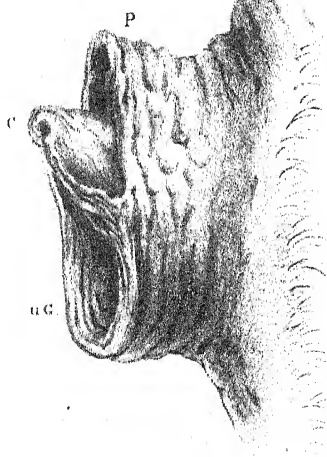


*Fig. 4.*

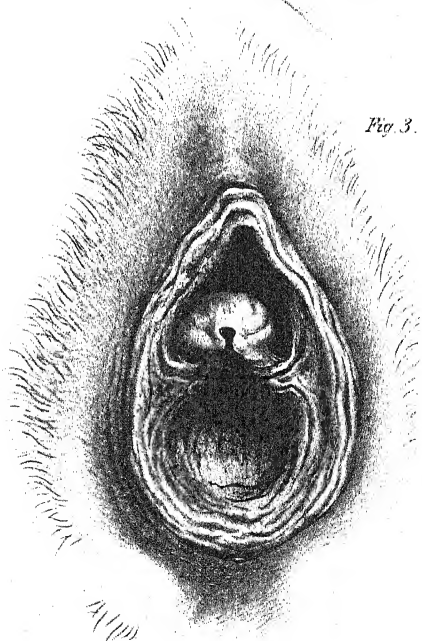


*Fig. 1.*

*Fig. 2.*



*Fig. 3.*



A.H. Young del.  
J. Smit lith.

Hanhart sculp

ANATOMY OF SPOTTED HYENA.



he is dealing with the extremity of the male urethra, an error only corrected by an examination of the internal organs"<sup>1</sup>. This orifice, I showed, is situated on the *extremity* of the well-defined glans clitoridis, that portion of the glans which is placed *above* the opening in question being formed by the spongy structure of the corpora cavernosa clitoridis, whilst the extremity of the glans *below* the orifice is formed by the walls of the urinogenital canal itself. The glans clitoridis of the virgin is moreover surrounded by a well-defined prepuce. In the paper referred to, whilst directing attention to the small diameter of the urinogenital canal of the virgin *Hyæna crocuta*, I referred to the difficulty of explaining the passage of the young through so narrow a channel. An examination of the organs of the female which had borne young served to explain this difficulty, and showed that the external organs, including the urinogenital canal, undergo considerable alteration subsequent to parturition. These changes refer exclusively to the urinogenital canal, and more especially to the orifice of the latter, the internal organs of generation undergoing no alteration in form.

With regard to the alteration in size of the urinogenital canal, I found that whilst in the virgin that canal does not exceed half an inch in diameter at any part, and that its orifice at the extremity of the clitoris is not larger than to enable an ordinary knitting-pin to be inserted, in the female which had borne young, on the other hand, the canal becomes dilated to such an extent as readily to admit of the insertion of three fingers into the orifice, and of their passage backward through its entire length. The orifice of the urinogenital canal, together with the extremity of the clitoris, moreover undergoes considerable alteration. In the virgin the orifice of the canal is situated on the *extremity* of the clitoris, much as in the opposite sex; whilst in the female which has borne young the lower portion of the glans clitoridis, which in the virgin is formed by the lower wall of the urinogenital canal itself, entirely disappears, and consequently the canal, instead of opening upon the *extremity* of the glans clitoridis as in the virgin, opens altogether *below* that body (compare figs. 1, 2, 3, Plate XLIX.). Owing to this change in the relation of parts, the lower wall of the orifice of the urinogenital canal in the female which has borne young is formed, not by the lower portion of the glans clitoridis, but by the lower segment of the prepuce, with which the lower half of the glans clitoridis of the virgin has apparently coalesced. In the virgin female, moreover, the glans clitoridis, together with the orifice of the urinogenital canal, is contained within a single chamber formed by the encircling prepuce, the latter being attached to the glans by a single mesially placed frænum. In the female which has borne young, on the other hand, the coalescence of the lower half of the glans clitoridis with the corresponding segment of the prepuce has, so to speak, occasioned a splitting of the frænum clitoridis into two lateral halves, each of which is attached by one extremity to the lateral aspect of the glans clitoridis, whilst its other extremity is fused with the

<sup>1</sup> P. Z. S. 1877, p. 369.

opposing surface of the prepuce. Consequent upon this alteration in the state of the parts, the originally *single* chamber bounded by the prepuce becomes divided into *two* compartments—an upper, which contains the glans clitoridis, and a lower, in which is situated the orifice of the urinogenital canal. It appears, therefore, that in the female which has borne young the frænum of the prepuce becomes, as it were, separated into two lateral halves, and that these, owing to the dilatation of the orifice of the urinogenital canal, are displaced upwards, so as to subdivide the preputial chamber into two parts, an upper and a lower (Plate XLIX. fig. 3). At the same time the lower wall of the extremity of the urinogenital canal becomes adherent to and coalescent with the lower segment of the prepuce. In the mature female *Hyæna crocuta* the arrangement of the parts which constitute the external genital organs is almost identical with that which characterizes the genus *Elephas*, an arrangement which, so far as our present knowledge goes, is confined among mammals to one species of *Hyæna* and to the two species of *Elephant*<sup>1</sup>.

But not only does the orifice of the urinogenital canal, together with the extremity of the clitoris, undergo alteration in the female which has given birth to young as compared with the virgin; the entire perineal region undergoes a marked change in appearance. This change is due to the fact that in the former the perineal region becomes more flaccid and “baggy” in character. To this is attributable the fact that the “scrotal pouches” which I referred to in my previous paper as being prominent in the virgin, become less so in the female which has borne young; and consequently the resemblance which the external organs of the virgin female bear to those of the male becomes considerably modified subsequent to parturition. In the mature female, moreover, the glans clitoridis, instead of projecting beyond the free margin of the prepuce as in the virgin, becomes concealed within the flaccid folds of the latter, which, by reason of the “baggy” condition of the entire perineal region, is not so clearly defined from the surrounding integument as it is in the virgin. That this concealment of the clitoris of the adult female, as compared with that of the virgin, is not due to any diminution in size of the organ itself in the former, is shown by the fact that, whilst in the virgin which I first examined the clitoris measured  $6\frac{1}{2}$  inches in length, and the penis of the male which I formerly examined measured 8 inches in length, in the female which had borne young I found that the clitoris measured  $6\frac{1}{2}$  inches in length, and the penis of the second and more mature male which I received from the Society’s Gardens measured 9 inches in length. The dimension of the clitoris in both specimens is the same, whilst the relative size of the male and female organs are nearly alike in both cases. The lesser prominence of the clitoris in the female which had borne young is therefore attributable to the greater flaccidity of the tegumental folds surrounding it, consequent on parturition, rather than to any diminution in size of the clitoris itself.

<sup>1</sup> Watson, “On the Female Organs of the Proboscidea,” Trans. Zool. Soc. vol. xi.



On the glans clitoridis of the virgin female which I formerly described, I failed to distinguish any trace of the recurved spines which beset the glans penis of the opposite sex. In the mature female, on the other hand, the glans clitoridis is invested by a number of minute spines, which, however, were neither so numerous nor of so horny a nature as the corresponding structures of the male organ. The presence of these spines in the mature female and their absence in the virgin appear to show that they are structures of comparatively late growth.

*Nipples.*—The nipples in the female which has produced young are four in number. Of these two are of small size and had apparently never been functionally active. They are situated one on either side of and almost in contact with the side of the prepuce. They are symmetrically placed near either side of the middle line, and are separated from one another by a distance of  $1\frac{1}{2}$  inch. Of these two nipples, the right is smaller than the left. The other two nipples were of large size; and both had evidently given suck. Like the first pair, they are situated symmetrically on either side of the middle line, at a distance of  $2\frac{1}{2}$  inches from the latter and 3 inches in front of the free border of the prepuce. Each measures  $1\frac{1}{2}$  inch in length. In the second male which I examined I could only distinguish a single pair of rudimentary nipples. They were symmetrically disposed, one on either side of the free margin of the prepuce, but not in contact with the latter as in the mature female, but separated from the prepuce by a distance of 2 inches. It will be seen, therefore, that in the two sexes the nipples neither correspond in respect of number nor of position.

In my previous papers I showed that in the female the anal scent-glands much exceeded in size those of the male. Further observations on the size of these glands in the two specimens last examined show that the anal glands in both sexes are of the same size, and that they equal those of the virgin which I first dissected. Probably the difference in size of these glands in the two male specimens is explicable on the supposition that the specimen last examined had attained greater sexual maturity than the first, and that the anal glands, like certain of the sexual glands, only attain their full size some time after sexual maturity has been reached.

#### *Male.*

In a former communication<sup>1</sup> I directed attention to the difference between Prof. Flower's observations and my own with regard to the presence of a prostate gland in the male *Hyæna crocuta*. The examination of the male which I received last summer proved that a prostate gland is undoubtedly present in the male of this animal, as described by Professor Flower. Its form in the specimen referred to exactly agrees with the description which I formerly gave, founded upon an examination of the organs which Prof. Flower kindly placed at my disposal. The prostate (Plate XLIX. fig. 4) consists of two distinct masses, each measuring 1 inch in

<sup>1</sup> P. Z. S. 1878, p. 419, footnote.

length and half an inch in breadth, placed one on either side of the commencement of the urethra. The two lobes are, moreover, inseparably united by an intermediate isthmus, which extends across the upper wall of the urethra. The prostate gland of *H. crocuta* appears therefore to resemble closely that of *H. striata* as figured by Leuckart<sup>1</sup>, but is more flattened from above downwards than in that animal. The absence, or apparent want of differentiation, of the prostate gland from the surrounding tissue in the first specimen which I examined of the male *H. crocuta*, taken in conjunction with its large size and clear differentiation in both the other specimens, each of which was known to be of great age, seems to show that this gland, like the anal scent-glands, only attains its full size at a period somewhat later than that at which the animal attains sexual maturity.

In addition to the careful investigation of the anatomy of the male and female generative organs, I made a particular examination of the other viscera of both the specimens forwarded to me by the Society. With regard to these, however, I noticed nothing of importance with which to supplement my previous description, beyond some few variations in respect of the number of pulmonic lobes in the different specimens. In the male previously described by Mr. Young and myself<sup>2</sup>, the lung of the right side was subdivided into six lobes, whilst that of the left was subdivided into three. In the female, the anatomy of which forms a portion of the present communication, I found that the right lung was subdivided into *five* lobes, this being due to the fact that the fissure which separates lobes 1 and 3 of our first specimen did not exist, and that consequently these two lobes were fused to form a single one. The left lung of this specimen agreed exactly with the description previously given. In the second male which I examined I found that the anterior vertical fissure (previously described by us) in the left lung had likewise disappeared, so that the lobes 1 and 2 were almost completely fused. In the right lung of the same specimen there was a mere indication of the fissure which, in the joint paper referred to, separates lobes 1 and 2, whilst the fissure separating lobes 1 and 3 had completely disappeared. Consequently the lobes 1, 2, and 3, which in the specimen examined by Mr. Young and myself were perfectly distinct, were fused together and formed a single mass of pulmonary tissue. In this specimen, therefore, the right lung was subdivided into *four* lobes only, and not into six (as in the specimen described in our former paper).

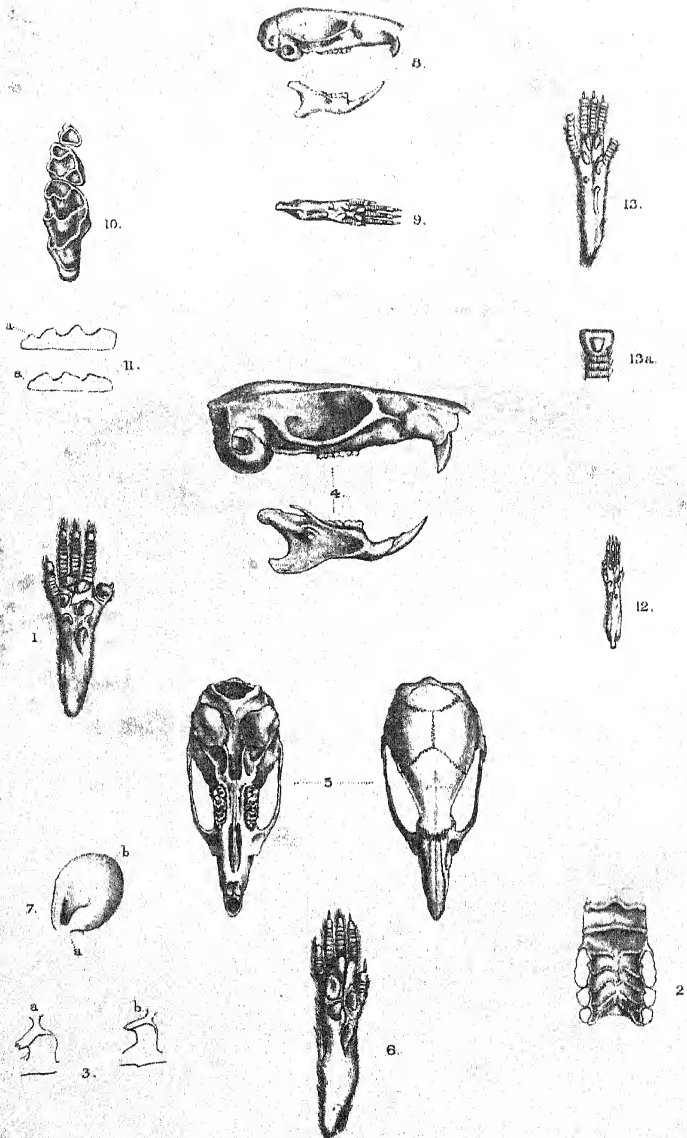
Thus it would appear that the number of lobes into which the lung is divided varies in different specimens of the same species of *Hyæna*, and that consequently no weight can be placed on the number of pulmonic lobes in any attempt to define the specific characters of the various species of *Hyæna*.

I am indebted to the kindness of my friend Mr. Alfred Young for the drawings from nature which accompany this paper.

<sup>1</sup> Cyclopædia of Anatomy, art. VESICULA PROSTATICA

<sup>2</sup> P. Z.S. 1879, p. 87.





## EXPLANATION OF PLATE XLIX.

- Fig. 1. External female organs of virgin *Hyæna crocuta*, showing the orifice of the urinogenital canal situate upon the *extremity* of the glans clitoridis, both being included within the *single* chamber bounded by the prepuce. P, prepuce; U.G, orifice of the urinogenital canal.
2. External female organs of *H. crocuta* subsequent to parturition, lateral view. The figure shows that the urinogenital canal instead of opening upon the *extremity* of the glans clitoridis, as in the virgin, opens altogether *below* that body; and moreover that the extremity of the clitoris and the orifice of the canal are contained in *two* separate chambers included by the prepuce, and separated by the two portions of the frænum preputii. P, prepuce; C, clitoris; U.G, orifice of urinogenital canal.
3. The same, seen from the front. Externally is the prepuce, within which are included, in separate chambers, the clitoris above and the orifice of the urinogenital canal below.
4. Prostate gland of male *Hyæna crocuta*. VV, vasa deferentia. P, prostate gland. U, urethra.

### 3. On the Indian Species of the Genus *Mus*. By OLDFIELD THOMAS, F.Z.S., British Museum.

[Received March 23, 1881.]

(Plates L., LI.)

The following paper is an attempt to clear up the extreme confusion which exists with regard to the synonymy of the Indian species of the extensive genus *Mus*. How great this confusion is will have been evident to any one who has tried to affix the proper name to any Indian specimen of the genus; and it is hoped that the present account of the species, being founded almost entirely on the types, will be of use to collectors and others attempting to name an Indian rat or mouse in the future. The chief, and almost only general paper on the subject is one by the late Mr. E. Blyth, entitled "A Memoir on the Rats and Mice of India."<sup>1</sup> This memoir, which consists of a collection of references to all the Indian species, though extremely useful as giving a nearly complete list of all the previous descriptions, yet cannot be said to have added very much to our knowledge of the Indian rats and mice. Dr. Jerdon, in his 'Mammals of India,' accepted Blyth's determinations, and added but little on his own account. Dr. J. Anderson<sup>2</sup> has recently written a most useful paper on the species of the subgenus *Nesokia*, which will be referred to later on.

One of the chief causes of the existing confusion was the fact that Mr. B. H. Hodgson, formerly British Resident at Nepal, having made a most magnificent collection in that country, described, either himself, or through Dr. Horsfield of the India Museum, a large number of species of this genus in the briefest possible manner; so

<sup>1</sup> J. A. S. B. xxxii. p. 327 (1863).

<sup>2</sup> J. A. S. B. xlvii. p. 214 (1878).

that, the types being in England and the workers on the subject in India, an attempt had to be made to determine the species from the published descriptions, an almost hopeless task. It must, however, be said that other authors have not given in all cases the most perfect descriptions, many of those of Mr. Blyth himself being especially short and unsatisfactory. In all, there have been no less than ninety Indian species described, belonging, in my opinion, to only nineteen valid species, thus giving an average of more than four synonyms to every species.

In writing the present paper I have had the advantage of access to the following materials, which, including as they do the types of the greater part of the described species, may be looked upon as quite unequalled.

1. Full series of all the species collected and described by Mr. Hodgson in Nepal, some presented by him direct to the British Museum, others obtained through the India Museum, South Kensington.

2. The types of the Indian species described by the late Dr. J. E. Gray.

3. A most valuable collection of specimens in spirit from all parts of India, numbering about 130 individuals. This was presented by Mr. W. T. Blanford, and collected partly by the donor himself and partly by Mr. Mandelli (Darjiling), Col. St. John (Ajmere), the Rev. S. Fairbank (Ahmednagar), Col. R. H. Beddome (South India), and others.

4. A considerable series of skins lent to me for examination by Mr. Blanford, and similarly collected in all parts of India.

5. The specimens collected by Sir Walter Elliot in the Southern Mahratta country and other parts of South India, including the types of the species described by him.

6. Collections of greater or less extent made by Dr. J. Scully (Gilgit), Captain Hutton (Mussooree), Capt. Pemberton (Bhotan), Dr. Kelaart (Ceylon), Mr. H. Cuming (Ceylon), etc.

7. The collection of drawings of Nepalese species formed by Mr. Hodgson, and lent to me by this Society, with manuscript notes appended to nearly all of them. These notes are hereafter frequently referred to.

8. A collection of about 50 spirit specimens from various parts of India; presented to the British Museum by the Trustees of the Calcutta Museum<sup>1</sup>.

Altogether I have examined about 450 Indian specimens. It will be seen by the asterisks prefixed to the names in the synonymy that, of the nineteen good species allowed here, we have the types of no less than thirteen, besides the types of all the four subspecies or

<sup>1</sup> This collection, kindly sent by Dr. Anderson, only arrived while the present paper was in the press; but it has nevertheless been of considerable service to me in confirming my results, the specimens being all named by Dr. Anderson, and being therefore very useful in helping the identification of those species of which the types are at Calcutta. The letter accompanying this collection is quoted in footnotes in several places below.

varieties, and also those of about forty species which are considered as synonyms.

With regard to what is here called "India," I have only taken the country west of the 90th degree of longitude, so as to exclude Assam and Burmah, as we have not yet sufficient material from these countries for me to work out the numerous species described from them. I hope, however, that Dr. Anderson or some one else to whom the Calcutta Museum is available, will work out these forms, the greater part of the species having been described by Mr. Blyth, and the types preserved there.

Before proceeding to a detailed account of the subgenera and species, I have to thank those who have assisted me in various ways. First, to Mr. W. T. Blanford I owe the most sincere thanks, not only for the generous present of specimens mentioned above, but also for constant aid given throughout the preparation of the paper, an aid which has been of the greatest use to me from his extensive knowledge of India and its mammal fauna. I also owe my thanks to Dr. Anderson, for examining for me several of Blyth's types, preserved in the Calcutta Museum; and to Dr. J. Scully for the use of his specimens from Gilgit, a locality particularly interesting as being just on the line between the Palearctic and Oriental zoological regions.

In this connection I must also record the very deep obligations I am under to my late friend Mr. E. R. Alston, whose premature death has deprived science of one whose careful and conscientious work upon Mammals is well-known to all zoologists, and who, since I first took up their study, has been a constant friend and helper to me in my work on that branch of science of which he had so intimate a knowledge.

The following are the subgenera into which the Indian species of *Mus* have been divided:—

1. *Nesokia*. Incisors very broad, finely sculptured in front. Molars composed of transverse laminae. Size large; form stout and heavy; tail rather short; fur coarse, not spiny.

2. *Mus*. Incisors narrow, smooth in front. Molars tubercular. Pollex only with a nail, the other digits with sharp compressed claws. Other characters variable.

3. *Leggada*. Like *Mus*, but the first upper molar with an extra tubercle in front (see Plate LI. figs. 10, 11). Fur generally, but not always, spiny; size small; tail short.

4. *Vandeleuria*. Teeth as in *Mus*. Both 1st and 5th digits of fore and hind feet with a nail. Size small; form slender and agile; fur soft; tail very long.

#### Subgenus NESOKIA.

*Neotoma*, Ell. Madr. Journ. x. p. 208 (nec Say and Ord), 1839.

*Nesokia*, Gray, Ann. & Mag. Nat. Hist. x. p. 264, 1842.

The members of this subgenus may always be readily distinguished by their bluff-headed and arvicoline aspect. Their dentition is

markedly different from that of *Mus* proper; and until recently *Nesokia* has been looked upon as a full genus; but Dr. Anderson, in the paper referred to above, states that he considers it to be only a subgenus of *Mus*, an opinion in which for the present I am disposed to concur. Dr. Anderson's paper contains a full and careful account of the group; but as he had not the advantage of examining Hodgson's and Gray's types, some of the synonyms were incorrectly placed, the natural result of such descriptions as had been given of these Rats.

I have been compelled to reduce the number of species somewhat, Dr. Anderson having allowed seven Indian species, while I consider that there are only four, with two subspecies or varieties. The reasons in each case will be given below.

The known range of the subgenus is, east and west, from Palestine to Formosa, the British Museum possessing specimens from both these localities, and, north and south, from Kashghar to Ceylon. The Palestine *Nesokia*, which was collected by Canon Tristram, appears to represent a new species; but, without seeing more specimens, I do not care to describe it as such.

The following synopsis, based on Dr. Anderson's "Sections," will show some of the chief distinguishing characters of the Indian species:—

- I. Anterior palatine foramina much shorter than the upper molar series; mammæ 8..... *M. (N.) hardwicki*, p. 524.
- II. Anterior palatine foramina as long as or longer than the molar series; mammæ 14-18 *M. (N.) bengalensis*, p. 526.
- III. Palatine foramina as in II., though rather more open behind. Mammæ 12.
  - a. Nasals broad, size very large ..... *M. (N.) bandicota*, p. 528.
  - b. Nasals narrow, size smaller ..... *M. (N.) nemorivagus*, p. 529.

# 1. *MUS (NESOKIA) HARDWICKII*.

## a. Var. *hardwicki*.

*Arvicola indica*, Gray & Hardw. Ill. Ind. Zool. i. pl. xi. (1832) (nec *Mus indicus*, Bechst.).

\*<sup>1</sup> *Mus hardwicki*, Gray, Charlesw. Mag. N. II. i. p. 585 (1837).

*Nesokia hardwicki*, Gray, Ann. & Mag. N. II. x. p. 265 (1842).

\*<sup>1</sup> ? *N. griffithii*, Horsf. Cat. Mamm. Mus. E.I. C. p. 145 (1851).

*Spalacomys indica*, Peters, Abhandl. Akad. Berl. 1860, p. 143, Taf. ii. f. 1 (skull) (1860).

*M. (N.) hardwicki*, Anders. J. A. S. B. xlvii. p. 221 (1878).

*Hab.* From Sind and the Punjaub eastwards to the North-west Provinces.

## b. Var. *huttoni*.

\* *Mus huttoni*, Blyth, J. A. S. B. xv. p. 139 (1846).

*Nesokia huttoni*, Blanford. Zool. Pers. p. 59, pl. vi. fig. 1 (1876).

*M. (N.) huttoni*, Anders. t. c. p. 223 (1878).

*Hab.* Persia, Afghanistan, and the more elevated parts of Sind.

*Specific characters.*—Fur variable in quality. Length from six to

<sup>1</sup> The asterisks prefixed to the names in the synonymy throughout, designate those species of which the types are in the British Museum.



seven inches; tail about equal to the body without the head. Mammæ 8, 2 pectoral and 2 inguinal pairs<sup>1</sup>. Skull very stout and strong, readily distinguished by its very short and narrow anterior palatine foramina, which are not so long as the first two upper molars, while those of the next species, *N. bengalensis*, are as long as the whole upper molar series. Teeth more rounded than in the other *Nesokia*, the laminæ more compressed from before backwards. (See Dr. Peters's figure referred to above.)

*Varietal Characters*.—Var. *hardwickei*. Fur generally short and harsh, yellowish brown above, dirty white below. Feet shorter than in var. *huttoni*.

Var. *huttoni*. Fur long and soft, bright rufous above, dull yellow below. Hind feet longer than in var. *hardwickei*.

#### Measurements.

	Var. <i>hardwickei</i> .		Var. <i>huttoni</i> .
	♂. Tong, Sind.	♂. Jacobabad, Sind.	♂. Baluchistan.
Head and body <sup>2</sup> .....	5.9	6.3	6.5
Tail <sup>3</sup> .....	3.8	4.35	4.5
Hind foot <sup>4</sup> .....	1.2	1.2	1.45
Forearm and hand <sup>5</sup> .....	1.7	1.61	1.95
Ear-conch, length <sup>6</sup> .....	.52	.59	.57
Muzzle to ear <sup>7</sup> .....	1.45	1.45	1.55

These measurements would appear to be rather below the average, those given by Dr. Anderson being considerably more.

I think there can be but little doubt as to the necessity of uniting the two forms of this species. One of our specimens (*a*), from Tong, Sind, has the long, soft and bright-coloured fur of var. *huttoni*, while

<sup>1</sup> Mr. Blanford (*l. c.*) stated that there were only 6 mammæ in his Persian specimens; but he must have overlooked one of the anterior pairs, as those of his specimens which came to the British Museum have 8, as also, *vide* Dr. Anderson, have those that went to Calcutta.

<sup>2</sup> Taken by placing the head and body as nearly as possible flat, and then measuring in a straight line, and not along the curves.

<sup>3</sup> From the anus to the end of the vertebræ, one point of the compasses being placed quite in the anus, so as to get to the true root of the tail.

<sup>4</sup> From the calcaneum to the tip of the longest toe, not including the claws.

<sup>5</sup> From the olecranon to the tip of the longest finger, also without the claws. This is a most useful measurement for showing the comparative lengths of the fore and hind limbs, that of the hand only being extremely difficult to take with accuracy.

<sup>6</sup> From the external root of the conch (see Plate LI. fig. 7, *a* to *b*). The skin shifts so much on the head that measuring from the meatus is very unsatisfactory.

<sup>7</sup> From the tip of the nose to the inside of the auditory meatus, one point being placed in the meatus as far as it will go without hurting the skull. This is a measurement which should always be given, being almost the only one that can be relied upon for perfect accuracy in showing the general size of the animal. It is particularly useful with regard to the proportion that the limbs and tail bear to the trunk.

I may here state that every measurement given is taken from a specimen preserved in spirit, except where otherwise stated, and that therefore the size of the body will be found to be somewhat larger when measured in the flesh.

the shortness of its feet would cause it to be placed with var. *hardwickei*. Of several skins from the same place, moreover, some have all the fur-characters of one and some of the other variety. Mr. Blanford, in his 'Mammalia of Yarkand'<sup>1</sup>, has said that he doubts whether the differences between the two forms are constant; and Dr. Anderson seems to have been quite unable to find any important differences between the skulls, though he keeps the two species distinct<sup>2</sup>. I think therefore that it will be better to regard *N. hardwickei* and *N. huttoni* as geographical races of one species, the former occupying the low countries of Sind and North-west India, and the latter the comparatively higher regions of Persia and Afghanistan. It is true that the types of the two varieties look extremely different; but that of *M. (N.) hardwickei* has been enormously overstretched, so that it looks quite double the size of that of *M. (N.) huttoni*, its skull and feet, however, showing that the difference in size is almost wholly artificial.

The type of *N. griffithii*, Horsf., is undoubtedly a specimen of this species, and seems to be, on the whole, rather more like var. *hardwickei*; but it is such a bad skin that I cannot determine this point with certainty. *Mus pyctoris*, Hodgs., which Dr. Anderson placed here, is not a *Nesokia* at all, but a true *Mus*, as shown by the type, and is a synonym of *M. alexandrinus*, var. *nitidus*<sup>3</sup>.

## 2. MUS (NESOKIA) BENGALENSIS.

### a. Northern race (*N. bengalensis*).

*Arvicola bengalensis*, Gray & Hardw. Ill. Ind. Zool. ii. pl. 21 (1833-34).

\* *Mus daccanensis*, Tytler, Ann. & Mag. N. H. xiv. p. 173 (1854).

*M. \* tarayensis* et \* *plurimammis*, Hodgs., Horsf. Ann. & Mag. N. H. xvi. p. 112 (1855).

\* *M. morungensis*, Hodgs., Horsf. l. c. (juv.) (1855).

*Nesokia indica*, Blyth, J. A. S. B. xxxii. p. 328 (1863); Jerd. Mamm. Ind. p. 187 (1867) (nec *M. indicus*, Bechst.).

*M. (N.) blythianus*, Anders. J. A. S. B. xlvii. p. 227, pl. xiii. figs. a to d (1878).

*M. (N.) barclayanus*, Anders. t. c. p. 229, pl. xiii. figs. i to l (1878); Blanford, Zool. Yark. Exp., Mamm. p. 46, pl. x. a. fig. 1 (skull) (1879).

*Hab.* North and Central India. ? Malacca and Andaman Islands.

### b. Southern race (*N. kok*).

\* *Mus kok*, Gray, Charlesw. Mag. N. H. i. p. 585 (1837).

\* *M. (Neotoma) providens*, Ell. Madr. Journ. x. p. 209 (1839).

\* *M. dubius*, Kel. J. A. S. Ceylon, 1851 (nec Hodgs.) (1851).

<sup>1</sup> Mamm. Yark. Exp. p. 47, 1879.

<sup>2</sup> Dr. Anderson now agrees with me as to the propriety of uniting these two forms.

<sup>3</sup> See below, p. 533.

*Nesokia hardwickei*, Kelaart, Prodr. Faun. Zeyl. p. 65 (1852) (nec Gray).

*M. (N.) providens*, Anders. J. A. S. B. xlvii. p. 225, pl. xiii. figs. e to h (1878).

*Hab.* South India and Ceylon.

*Specific Characters.*—Form stout and heavy, muzzle blunt. Fur rather short and harsh, grizzled brown above, rather paler below. Ears short; laid forward they do not reach to the eyes. Tail shorter than the head and body, uniformly brown above and below. Feet of medium size, nearly always brown above. Foot-pads small and rounded, five on the fore and six on the hind feet, as in the other species of the subgenus. Mammæ very numerous, from 14 to 18 in number, often different on the two sides of the body.

The skull is rather more like that of a true *Mus* than in *N. hardwickei*. The most important differences between the two have been mentioned under that species.

*Varietal Characters.*—Var. *bengalensis*. Size comparatively large. Tail somewhat longer in proportion, and anterior palatine foramina often (but by no means always) larger than in the southern race. Skull otherwise quite similar.

Var. *kok*. Smaller. Tail somewhat shorter than in the typical variety. Anterior palatine foramina very narrow.

#### Measurements.

	Var. <i>bengalensis</i> .		Var. <i>kok</i> .	
	Calcutta <sup>1</sup> .		Ootacamund.	Madras.
	♂	♀	♂	♀
Head and body . . . . .	8·0	7·8	7·3	7·0
Tail . . . . .	7·4	7·0	5·7	6·3
Hind foot. . . . .	1·4	1·45	1·32	1·4
Forearm . . . . .	2·0	2·05	1·75	1·81
Ear-conch, length . . . .	·82	·80	·80	·75
Muzzle to ear . . . . .	1·6	1·7	1·6	1·6

This species is the common *Nesokia* of the whole of India. The only animal with which it could possibly be confounded is *Mus decumanus*, from which, however, it may always be distinguished by its comparatively shorter head and broader incisors.

Dr. Anderson, in his paper above quoted, keeps the northern and southern forms separate under the names of *N. blythianus* and *providens*. The following are the characters upon which he founds his opinion as to their specific distinction:—"The skull (of *N. providens*) is considerably smaller than that of *M. (N.) blythianus* of the same age, from which it is also distinguished by its more outwardly arched malar process of the maxillary, by its considerably smaller teeth, and long but less open palatine foramina." The external characters given are those I have used to divide the species into varieties, except the "somewhat smaller ears" of *N. kok*, a character which does not

<sup>1</sup> These seem to be exceptionally large specimens, none of the specimens measured by Dr. Anderson having hind feet as much as 1·4 inch.

appear to be constant, as a specimen from the Neilgherries has distinctly larger ears for its size than any specimen of *N. bengalensis* that I have seen. As to the skull-characters mentioned, I can only suppose Dr. Anderson had but a small series under examination at the time of writing his paper; for, as far as I can see, the skulls intergrade completely. Taking the characters as given above, we see that the southern race is certainly a little smaller, but not very much; in fact two Madras specimens of ours are quite as large as average Bengal ones. I cannot see that there is any difference in the outward spread of the zygomatic arches, or in the size of the teeth. As to the anterior palatine foramina, it is true that many specimens of var. *bengalensis* have these very much broader; but, on the other hand, some of our Nepal specimens, necessarily of the northern form, have them fully as much contracted as any Madras individuals; we cannot, therefore, place any reliance on this character. The other characters incidentally mentioned seem all to be either variable or not sufficient to separate the two forms upon.

With regard to the name adopted for the species, I cannot agree with Dr. Anderson that Gray's name *bengalensis* cannot stand. The figure of "*Arvicola bengalensis*" represents the northern form without a doubt; and even if this name were discarded, it will be seen by the synonymy that there are no less than four other names which would have priority over that given by Dr. Anderson. The types of all of them are in the British Museum, and certainly belong to this species.

*M. (N.) barclayanus*, Anders., as Mr. Blanford (*l. c.*) has suggested, seems to be only a local variety of *N. bengalensis*, and not distinct enough to require a name.

*Mus setifer*, Horsf. apud Cantor<sup>1</sup> (and therefore, *fide* Blyth, *M. andamanensis*, Bl.<sup>2</sup>), is, judging from one of Cantor's own specimens, certainly a *Nesokia*, and apparently not separable from this species. I do not care, however, definitely to unite them until I have seen spirit specimens from Pinang or the Andamans, as some of the proportions may be different from those of the Bengal species, Cantor's specimen being a much stretched skin.

### 3. MUS (NESOKIA) BANDICOTA.

*Le Rat perchal*, Buff. Hist. Nat. Supp. vii. p. 276, pl. 69 (1789).

*Rat perchal* and *Bandicota*, Penn. Hist. Quadr. (ed. 3), ii. pp. 179, 180 (1793).

"*Der Bandikote*," et "*die indische Ratte*" Bechstein, Allgem. Uebers. der vierfüssige Thiere<sup>3</sup>, ii. pp. 497, 498 (ex Penn.) (1800).

*Mus bandicota* et *M. indicus* (nec Geoff.), Bechstein, tom. cit. pp. 713, 714 (1800).

*M. malabaricus* et *M. perchal*, Shaw, Gen. Zool. ii. pt. 1, pp. 54, 55 (1801).

*M. giganteus*, Hardw. Trans. Linn. Soc. vii. p. 306, pl. 18 (1804).

<sup>1</sup> J. A. S. B. xv. p. 254, 1846.

<sup>2</sup> J. A. S. B. xxix. p. 103, 1860.

<sup>3</sup> A German translation of Pennant's 'History of Quadrupeds', published at Weimar in two volumes, 4to, 1799-1800.

*M. (Neotoma) giganteus*, Ell. Madr. Journ. x. p. 209 (1839).

*M. (Nesokia) giganteus*, Anders. J. A. S. B. xlvii. p. 232, pl. xiv. figs. a to d (skull) (1878).

*Hab.* All India south of the Himalayan region, and Ceylon.

Size very large, over a foot in length. Tail generally about one fourth shorter than the head and body. Fur very coarse and harsh; grizzled black and white above, grey beneath. On the back the fur is very thickly mixed with long harsh black piles, much more numerous than in *M. (N.) nemorivagus*. Mammæ 12, three pectoral and three inguinal pairs. The skull is very large and heavy, being more than  $2\frac{1}{2}$  inches long in full-grown individuals; it has been well figured by Dr. Anderson (*l. c.*), together with the skulls of the other species of *Nesokia*.

The Common Bandicoot or Pig-rat is found all over the peninsula of India, and is almost too well known to need any description. It may always be known from large individuals of *Mus decumanus* by its much broader incisors and by the presence of the long black piles mixed with the fur of the back; these piles are often nearly 4 inches long, while they are quite absent in *M. decumanus*. *Mus (N.) nemorivagus*, its nearest ally, is the Bandicoot of North-eastern India, and is certainly very closely related to it; but I think that the two forms are specifically separable, the Himalayan form being smaller and having much softer fur, fewer long black piles, and narrower nasal bones. The differences in the skulls will be readily perceived by a reference to Dr. Anderson's plate above referred to.

#### 4. MUS (NESOKIA) NEMORIVAGUS.

\* *Mus nemorivagus*, Hodgs. J. A. S. B. v. p. 234 (1836); Ann. & Mag. N. H. xv. p. 266 (1845).

?\* *M. macropus*, Hodgs. Ann. & Mag. N. H. xv. p. 268 (juv) (1845).

?\* *Nesokia hydrophila*, Gray, Cat. Hodgs. Coll. p. 19 (1846) (nec Hodgs.).

\* *M. bandicota*, Swinh. P. Z. S. 1870, p. 635 (nec Bechst.).

*M. (Nesokia) elliotanus*, Anders. J. A. S. B. xlvii. p. 231, pl. xiv. figs. e-h (skull) (1878).

*Hab.* Nepal, Sikhim, Assam; Formosa (*Swinhoe*).

Smaller than the Common Bandicoot, from 9 to 11 inches in length, the tail about seven eighths of the length of the head and body. Fur comparatively soft, a certain number of longer piles intermixed; but these are neither so numerous nor so stiff as in *M. (N.) bandicota*. For further information about this species I must refer the reader to Dr. Anderson's description and figure of his *M. (N.) elliotanus*.

The following dimensions, as being those of a spirit specimen, may be of use. It is an adult female, and was obtained from the Khasi Hills by Mr. Blandford:—

Head and body 9 inches; tail 7·8; hind foot 1·9; forearm 2·35; ear-conch, length 0·9.

To Dr. Anderson belongs the credit of having perceived that there are two species of Bandicoot in India, all previous authors having confused this form with the true *M. bandicota*, Bechst. Hodgson's description of *M. nemorivagus*, however, was such that Dr. Anderson naturally could not tell that his *M. (N.) elliotanus* was identical with it. There can, however, be no doubt that it is the same, as the skull of the type of Hodgson's species exactly matches that of one of the Khasi-Hill specimens mentioned by Dr. Anderson, and since presented to us by Mr. Blanford, and also quite agrees with the figure which accompanies the description of *M. (N.) elliotanus*<sup>1</sup>.

Formosan individuals of this species received from Mr. Swinhoe are quite similar to our specimens from the typical locality. We thus get another instance of the affinity of the fauna of Formosa to that of the Himalayan region<sup>2</sup>.

The specimen described as *Nesokia hydrophila* by Dr. Gray, in his Catalogue of Hodgson's collection, is the actual type of *Mus macropus*, Hodgs. The cause of the mistake was that Hodgson's two species *M. hydrophilus* and *M. macropus* are figured side by side in Hodgson's drawings, and that in the British Museum duplicate copy the plate was accidentally marked as "*Mus hydrophilus* et junior," Gray therefore describing the specimen representing the adult form. In the original drawings, belonging to the Zoological Society, however, the two figures are named in accordance with Hodgson's published descriptions. This type specimen of *M. macropus* is most undoubtedly a *Nesokia*, and, I believe, will turn out to be a young specimen of the present species, the skull agreeing very fairly, though it is considerably smaller.

I am quite unable to say what the true *M. hydrophilus*, Hodgs.<sup>3</sup>, is. It is said to be a small species, only  $3\frac{1}{2}$  inches long, with a tail only  $2\frac{3}{4}$  in length. We have received no specimens of it from Mr. Hodgson; but I would suggest that it might be some species of *Arvicola*, as the proportions are similar to those found in that genus, and Hodgson on his drawing calls it *Arvicola? hydrophilus*, though he afterwards described it as a *Mus*.

It seems possible, as Mr. Blanford has suggested<sup>4</sup>, that *M. (Nesokia) nemorivagus* will yet turn out to be identical with the true *Mus setifer*, Horsf. Judging from the distribution of certain other species, it is quite probable that the Bandicoot of Java should be the same as that found in Nepal and Formosa; but merely from Horsfield's description, and without seeing Javan specimens, it is impossible to decide this question at present.

#### Subgenus *Mus* (restricted).

*Mus*, Linn. Syst. Nat. (12) i. p. 79 (1766).

Incisors narrow, smooth in front. Molars tubercular, not divided

<sup>1</sup> Dr. Anderson has sent us an immature specimen of his *N. elliotanus*, which quite confirms my identification.

<sup>2</sup> See below, under *M. jerdoni*, p. 539.

<sup>3</sup> Ann. & Mag. N. H. xv. p. 267, 1845.

<sup>4</sup> Zool. Yark. Exp. Mamm. p. 47, 1879.

into transverse laminæ as in *Nesokia*. Pollex truncated, with a short nail, all the other digits with sharp compressed claws.

To *Mus* as thus strictly limited I refer 12 of the species of Muridæ that have as yet been found within our limits; but there can be no doubt that several more species either hitherto undescribed, or only known from Assam and Burmah, will yet be found in Sikhim and the surrounding region. On the other hand, it seems improbable that there are many more species to be recorded from the peninsula of India, though the discovery of such a distinct form as *Mus blanfordi* shows that this region is not as yet absolutely worked out.

The following synopsis will, I hope, be of use to persons wishing to determine specimens of this difficult group; but it will as a rule be necessary for those who consult it to examine properly preserved spirit or fresh specimens, as the characters used are not such as can be easily made out on dried skins. Wherever stress is laid on the proportion of any part to the head and body, it must be remembered that fresh specimens always have the trunk distinctly larger in proportion to the extremities than those preserved in spirit, and that all my measurements are of necessity from the latter. It will therefore sometimes happen that in a fresh specimen the tail is slightly shorter than the head and body when I have here stated it to be longer; but a reference to the detailed descriptions will always obviate any difficulty this may cause.

I. Hind feet with 6 well-defined foot-pads.

A. Large,  $4\frac{1}{2}$  to 9 inches; last hind foot-pad elongated.—RATS.

a. Whole of tail covered with short hairs; upperside of tail dark-coloured. 8-12 mammæ.

a. Tail dark above and below.

a'. Tail shorter than head and body; 10-12 mammæ; hind foot 1.5-1.7. 1. *M. decumanus*, p. 532.

b'. Tail longer than head and body.

a". Anterior edge of zygoma-root with a strongly marked rounded angle above. 10-12 mammæ; hind foot 1.2-1.45..... 2. *M. alexandrinus*, p. 533.

b". Anterior edge of zygoma-root nearly perpendicular; hind foot .95-1.05..... 3. *M. fulvescens*, p. 537.

β. Tail sharply bicolor, dark above and white below. 8 mammæ.

c'. Back bright rufous; tail much longer than head and body; hind foot 1.0-1.15..... 4. *M. jerdoni*, p. 537.

d'. Back yellowish grey; tail barely longer than head and body; hind foot 1.0..... 5. *M. niveiventer*, 540.

b. Distal third of tail with longer hairs, white above and below. 6 mammæ.

c'. Hind foot 1.2-1.35..... 6. *M. blanfordi*, p. 541.

- B. Small, 2-4 inches. Last hind foot-pad circular.—Mice.
- c. Anterior edge of zygoma-root perpendicular.
- γ. 10 mammæ.
- f'. Tail as long as, or longer than, head and body.
- c". Colour rufous-brown, belly scarcely lighter; hind foot '62-'7. 7. *M. urbanus*, p. 544.
- d". Colour pale fulvous, belly white; hind foot '65-'75. .... 8. *M. bactrianus*, p. 546.
- g'. Tail shorter than head and body. (See also under *Leggada buduga*, p. 553.)
- e". Hind foot '6-'65; ear '41-'49 ... 9. *M. cervicolor*, p. 547.
- δ. 6 mammæ.
- h'. Tail as long as, or longer than, head and body; hind foot '82-'88. .... 10. *M. arianus*, p. 548.
- d. Anterior edge of zygoma-root slanting. (See Plate LI. fig. 8.)
- i'. Tail rather longer than the head and body; hind foot '75-'8. .... 11. *M. nitidulus*, p. 550.
- II. Hind feet with only 4 or 5 properly developed foot-pads.
- e. 8 mammæ; tail about the length of head and body; hind foot about 1'0. .... 12. *M. mettada*, p. 550.

## 5. *MUS DECUMANUS*.

*M. decumanus*, Pall. Nov. Glir. p. 91 (1778).

*M. decumanoides*<sup>1</sup>, Hodgs. J. A. S. B. x. p. 915 (sine descr.) (in part) (1841).

\**M. brunneus*, Hodgs. Ann. & Mag. N. H. xv. p. 266 (1845).

*Hab.* Cosmopolitan.

No description is needed of this too well-known rat. It may always be distinguished from any specimen of *M. alexandrinus* by its short tail and ears, and its larger size. The following are the chief dimensions of a full-grown male:—Head and body 8'3, tail 7'1, hind foot 1'6, ear-conch 0'7, muzzle to ear 1'85.

The type of *Mus brunneus*, Hodgs., is certainly a specimen of this species, as might be expected from his description. Though most certainly not indigenous, Mr. Blanford tells me that these Rats are found on all the rivers of India, being carried up by the boats, and that by this means they might easily have got into the valley of Nepal, by way of the rivers Gunduck and Coosy.

We now come to the truly indigenous Indian species of *Mus*. The first one that claims our attention is the common house- and tree-rat of the whole of India, the *Mus rufescens*, Gr., of Blyth and other authors. After careful comparison of a very large number of specimens from all parts of India, I have come to the conclusion that

<sup>1</sup> In Horsfield's 'Catalogue of the Mammals in the India Museum' (p. 140), he mentions a "*Mus decumanoides*, Temm." Temminck never described a Rat under this name, as far as I can find; and Dr. Jentink, of the Leyden Museum, where Temminck's types are preserved, has kindly confirmed my opinion on this point.



this Rat is only a southern offshoot of that form of *Mus rattus* commonly known as *M. alexandrinus*. In India we find three just distinguishable varieties of it :—(1) the true *M. alexandrinus*, found in Cashmere, and the whole north-west region of India ; (2) the form confined to the Nepalese district, here termed var. *nitidus*, Hodgs. ; and (3) the well-known *M. rufescens*, Gr., found in the whole of continental India except the north-western part, and also in Burmah.

The following is the Indian synonymy of this species and its two varieties ; but it is very possible that some of the names are put under the wrong varieties, as these are not very sharply separated from each other.

#### 6. MUS ALEXANDRINUS.

##### a. Typical variety.

*M. alexandrinus*, Geoff. Desc. de l'Égypte, Hist. Nat. ii. p. 733, Atl. pl. v. fig. 1 (1812).

\**M. asiaticus*, Gray, Charlesw. Mag. N. H. (2) i. p. 585 (1837).

"*M. arboreus*, Buch. Ham." <sup>1</sup>Horsf. Cat. Mus. E.I. C. p. 141 (in part) (1851).

?*M. crassipes*, Blyth, J. A. S. B. xxviii. p. 295 (juv.) (1859).

##### b. Var. *nitidus*.

\**M. nitidus*, Hodgs. Ann. & Mag. N. H. xv. p. 267 (1845).

\**M. pyctoris*, Hodgs. l. c. (1845).

?*M. rattoides*, Hodgs.<sup>2</sup> l. c. (1845).

*M. horeites*, Hodgs. l. c. p. 268 (juv.) (1845).

\**M. æquicaudalis*, Hodgs. op. cit. (2) iii. p. 203 (1849); Horsf. Cat. Mamm. Mus. E.I. C. p. 144 (1851).

##### c. Var. *rufescens*.

*M. indicus*, Geoff., Desm. Mamm. ii. p. 299 (nec Bechstein<sup>3</sup>, 1800) (1822).

\**M. rufescens*, Gray, Charlesw. Mag. N. H. (2) i. p. 585 (1837).

\**M. flavescens*, Ell. Madr. Journ. Lit. Sci. x. p. 214 (1839) (nec Waterh. P. Z. S. 1837, p. 19).

*M. decumanoides*, Hodgs.<sup>4</sup> J. A. S. B. x. p. 915 (sine descr.) (in part) (1841).

\**M. brunneusculus*, Hodgs. Ann. & Mag. N. H. xv. p. 267 (1845).

<sup>1</sup> The drawing and description, but not the specimen (B), which is *M. decumanus*.

<sup>2</sup> Or the true *Mus rattus*; more probably a black-bellied individual of this variety.

<sup>3</sup> See under *M. (Nesokia) bandicota*, p. 528.

<sup>4</sup> Never described; afterwards divided by Hodgson into *M. brunneus* and *brunneusculus*.

*M. nemoralis*, Blyth<sup>1</sup>, J. A. S. B. xx. p. 168 (1851).

\**M. kandianus* & \**M. tetragonurus*, Kcl. J. As. Soc. Ceylon (1851).

*M. ceylonus*, Kel. Prodr. Faun. Zeyl. p. 61 (juv.) (1852).

*M. robustulus*, Blyth, J. A. S. B. xxviii. p. 294 (1859), fide Blanford, J. A. S. B. xlvii. p. 165 (1878).

?*M. infralineatus*, Blyth, J. A. S. B. xxxii. p. 348 (1863) (juv.).

"*Euchaetomys*<sup>2</sup> *rufescens*, Gray," Fitzinger, SB. Ak. Wien. lvi. i. p. 74 (1867).

*Specific Characters*.—Fur harsh, sometimes mixed with fine spines. Colour varying from dark rufous-grey to bright reddish fulvous; belly sometimes quite white, sometimes no lighter than the back. Feet nearly always white. Tail longer than the head and body, *scarcely lighter below than above*. Ears large; laid forward they reach quite to, or even beyond the eye. Foot-pads 5-6, well-defined. Mammæ 10, 11, or 12, normally three pectoral and three inguinal pairs; but one or both of the posterior pectoral pair are often absent. The length of the head and body (in spirit) varies from 5 to 7, the tail from 6 to 9, and hind foot from 1.2 to 1.5 inches; these, however, are the extreme limit. For detailed measurements see below.

*Varietal Characters*.—*Typical variety*. Dark rufous-grey above, white below. Size large, over 6 inches; tail much longer than the head and body, more noticeably paler below than in the other varieties. Soles of feet nearly always white (in spirit).

Variety *nitidus*. Fur finer and rather more rufous, often mixed with numerous spines. Belly sometimes pure sharply-defined white, sometimes almost as dark as the upperside, the tips of the hairs, however, being nearly always white. Size about the same as in typical *alexandrinus*. Tail generally only a little longer than the head and body, seldom exceeding them by more than one inch; stretched skins therefore often have the tail even shorter than the trunk. Soles of feet often quite black.

Variety *rufescens*. Body small and slender, only just over 5 inches in length. Tail much longer than the head and body. Colour dull rufous, generally but little paler below; fur coarse and spinous. This variety is much more arboreal than the others.

I can find no differences whatever between the skulls of these three varieties. Their general characters are too well-known to need any detailed description; the dimensions of a specimen of var. *rufescens* will be found below under *Mus blanfordi*<sup>3</sup>. The remarkable variation in the length of the nasal bones presented by this species is referred to below<sup>4</sup>.

<sup>1</sup> Blyth, op. cit. xxxiv. p. 192 (1865), says that this is the same as *M. brunneus*, Hodgs., which is a *Mus decumanus*; his description, however, agrees much better with this form, and a specimen sent as *M. nemoralis* by Dr. Anderson is certainly a *Mus rufescens*.

<sup>2</sup> A genus (!), composed of a ridiculous mixture of species of *Mus*, *Nesokia*, and *Leggada* which have no special affinity with each other whatever.

<sup>3</sup> Vide p. 541.

<sup>4</sup> Vide p. 536.

## Table of Measurements.

	Var. <i>alexandrinus</i> .			Var. <i>nitidus</i> .			Var. <i>rufescens</i> .	
	Cashmere.	Muscat.		Darjiling.			Madras.	Ceylon.
Head and body.....	♂ 6.1 ♀ 6.3	♀ 6.1		♂ 6.8 ♂ 6.45 ♀ 5.8			♀ 5.5	♀ 5.2
Tail .....	7.1 7.3	9.3		7.3 6.7 6.2			6.7	7.65
Hind foot .....	1.4 1.25	1.29		1.45 1.4 1.2			1.45	1.22
Forearm and hand	1.66 1.50	1.64		1.8 1.7 1.5			1.67	1.45
Ear-conch, length...	.68 .71	.85		.76 .78 .71			.71	.70
Muzzle to ear .....	1.44 1.49	1.55		1.72 1.56 1.38			1.4	1.31

These varieties seem to grade insensibly into one another. The Rats of Cashmere and the neighbouring region agree perfectly with Egyptian specimens of *M. alexandrinus*<sup>1</sup>; then, proceeding southwards, we find their fur becoming rather coarser and more rufous, and the animals themselves becoming smaller, though presenting still much the same proportions. On the other hand, as we go from Cashmere to Nepal, we find every intermediate stage between the true *M. alexandrinus* and the fine-haired, comparatively short-tailed var. *nitidus*<sup>2</sup>. We must therefore consider them all to be of but one species, especially as we often find specimens which, without a knowledge of locality, it would be quite impossible to assign with certainty to any one of these three different forms.

With regard to the name adopted for the South-Indian variety, Mr. Blanford has kindly examined for me the types of *Mus indicus*, Geoffr., in the Paris Museum, and tells me that they are most certainly specimens of the Rat generally known as *M. rufescens*, Gr.; and as their locality (Pondicherry) is a place where *M. rufescens* would naturally be found, I think there can be no doubt whatever as to the correctness of Mr. Blanford's opinion. As, however, the name *M. indicus* has been previously used by Bechstein, the later name *M. rufescens* must still stand for the Common Rat of the peninsula of India. The types of both *M. indicus* and *M. rufescens* have been much stretched, so as to have given rise to the erroneous statement in each case "Tail shorter than the head and body."

I have not space to discuss the various synonyms given above; but it will be seen that we have the types of a great number of these so-called species; and those of Hodgson's names to which I have not prefixed an asterisk merely represent forms of which we really possess the typical specimens among our series, but, as they are not specially marked as such, I am unable to lay my hand upon them.

<sup>1</sup> In Dr. Scully's most useful paper "On the Mammals of Gilgit" (P. Z. S. 1881, p. 204), we find the following:—"The Gilgit Rat is not separable from the so-called *M. rufescens* of Calcutta, or *M. robustus*, Blyth, of Burma; and it also agrees in all essential characters with *M. alexandrinus*, Geoff. A specimen of *M. alexandrinus* from Algeria, in the British Museum, only differs from one of my Gilgit specimens in having rather harsher fur."

<sup>2</sup> The typical *M. rufescens* is also found in Nepal, there being a considerable series of this form from that country sent by Dr. Anderson.

I have, with some doubt, placed *M. infralineatus* under var. *rufescens*, as the colour characters given are quite unimportant, and the proportions might be those of an overstretched half-grown individual; it is, however, very possible that I may be wrong, and that it is a distinct species.

Sir Walter Elliot informs me that this species seems to be gradually giving way before the more powerful *M. decumanus*, which has been introduced into the various Indian ports from the shipping, just as in Europe the same ubiquitous species has nearly exterminated the corresponding northern form *Mus rattus*.

With regard to the specific distinctness of *Mus alexandrinus* from *M. rattus*, about which so much has been written, it seems to me that we have here a somewhat parallel case to that of *M. urbanus* and *M. musculus*. *M. alexandrinus* would seem to be a more tropical form of *M. rattus*; but as it seems always to have much shorter, coarser, and more rufous hair, as compared with the black and shining fur of *M. rattus*, I have provisionally kept them distinct, though I have but little doubt that they will have finally to be considered as but one species. This, however, is a question not specially Indian; and so at present I prefer to avoid expressing any definite opinion on the subject.

The extraordinary variation of the nasal bones of this species has been mentioned above. Some authors have used the length of these bones as a specific character; and certainly the extremes in this species are so great as to appear to be of importance; but when a series is examined it will be found that no stress can be laid on this character. In order to prove how great the variation is, I have prepared the following Table; all the specimens measured were collected *at the same time and place*, and are obviously all of the same species.

Measurements of Skulls and Nasal Bones of Darjiling Rats (*Mus alexandrinus*, var. *nitidus*):—

Total length of skull.	Nasal bones.	Percentage of nasal bones to rest of skull.
millim.	millim.	
31·6	10·5	49
33·5	11·0	46
39·0	15·0	62
40·0	14·5	57
41·9	16·4	64
42·0	14·8	54
42·5	17·0	66
42·6	14·6	52
44·0	18·0	69
44·5	17·0	62
44·7	16·7	59
48·0	19·5	69

If we now arrange these percentages in order, we obtain the following series, in which it is perfectly impossible to draw any dividing line

between the specimens with long and those with short nasal bones—46, 49, 52, 54, 57, 59, 62, 64, 66, 69. After examining such a series of figures as this, I think it will be generally admitted that the length of the nasal bones is a character which should be regarded with the very greatest caution before it is used to separate species upon.

#### 7. MUS FULVESCENS.

\* *Mus fulvescens*, Gray, Cat. Hodgs. Coll. p. 18 (1846).

\* *Mus candator*, Hodgs. Ann. & Mag. Nat. Hist. iii. p. 203 (1849); Horsf. Cat. Mus. E.I. C. p. 144 (1851).

*Mus cinnamomeus*, Blyth, J. A. S. B. xxviii. p. 294 (1859), nec Pictet, Not. Anim. Nouv. Mus. Gen. p. 64, pl. 19 (1844).

*Hab.* Nepal and Sikhim; Pegu (*Berdmore*).

Fur soft and fine, generally spineless, but with sometimes a considerable number of spines intermixed. Colour bright rufous above, with slate-coloured bases to the hairs; belly white, generally quite pure, but sometimes either mixed with slate-colour or with a fulvous-grey stripe down its centre. Tail long, brown above, and but slightly paler beneath, sometimes with a tendency to the development of a pencil of hairs at the tip. I have not been able to find out the number of mammæ present in this species. The skull, as in *Mus jerdoni*, differs from that of *M. alexandrinus* by the absence of the projecting angle in the front of the exterior wall of the infra-orbital foramen, by the more open lower part of the same foramen, by its smaller teeth and shorter anterior palatine foramina. The difference in the zygoma-root will be better understood by a comparison of the figures of the two forms (Plate L. fig. 3 a & b).

With regard to the measurements, it unfortunately happens that we have no spirit-specimens of this species; but the following are the nearest that can be made out from skins:—Head and body 4·5 to 5·5 in., tail 5 to 7 in., hind foot ·95 to 1·05 in.

*Mus octomammis*, Hodgs., was placed as a synonym of *M. candator* by Gray; but from Hodgson's drawing it would rather seem to be *M. jerdoni*, which we know has only eight mammæ.

The exact position of this species is very doubtful, and can only be settled by the examination of a good series of specimens properly preserved in spirit. Jerdon<sup>1</sup> placed *M. fulvescens* as a synonym of *M. infralineatus*, and quite separate from *M. candator*; the types of this latter and of *M. fulvescens*, however, are undoubtedly identical.

#### 8. MUS JERDONI.

*Leggada jerdoni*, Blyth, J. A. S. B. xxxii. p. 350 (1863).

? "*Mus octomammis*, Hodgs.," Gray, Cat. Hodgs. Coll. 2nd ed. p. 10 (1863) (sine descr.).

*Hab.* Sikhim; Khasya Hills, Assam (*Blanford*); Java (*v. Hügel*).

Fur long, fine, usually with numerous spines intermixed. Above

<sup>1</sup> Mamm. Ind. p. 197 (1867).

the general colour is bright rufous, the hairs being dark slate-colour for four fifths of their length, and the tips being orange-red; on the centre of the back there are numerous wholly black hairs mixed with the others; these thin out towards the sides, so that there the rufous colour is much clearer. Spines white, with black tips. Belly pure white, the line of separation well defined. Feet white as a rule, though sometimes the dark colour of the upper side runs down as far as the base of the digits. Tail very long, generally two and sometimes three inches longer than the head and body, brown above and white beneath from root to tip. Mammæ eight, two pectoral and two inguinal pairs. Hind foot-pads (Plate LI. fig. 1) six, large, nearly circular except the last, the terminal pad of the hallux very large. Ears rather large, oval; laid forward they reach quite to the eye.

The skull is somewhat like that of *M. fulvescens*, differing from that of *M. alexandrinus* by its smaller teeth, the upper series measuring in this species 5·8 millim., and in an equal-sized specimen of *M. alexandrinus*, 7·0 millim. The auditory bullæ are more flattened, only standing about 1·5 millim. above the base of the skull; while in *M. alexandrinus* they are 3 millim. high, and are much more inflated. There is the same form of the anterior zygoma-root already mentioned as obtaining in *M. fulvescens*; and, lastly, the emargination between the condyle and the posterior angle of the lower jaw seems to be shallower than usual.

#### Measurements.

	Darjiling.		
	a. ♂.	b. ♀.	c. ♂.
Head and body.....	5·3	(c) 5·0	5·4
Tail .....	7·1	6·8	8·5
Hind foot .....	1·15	1·15	1·15
Forearm.....	1·45	1·45	1·45
Ear-conch, length .....	·76	·68	·72
Muzzle to ear .....	1·38	..	1·30

It will be noticed that the hind foot and the forearm are exactly the same in all. Specimen *c* is said to have come from Malabar; but I think there can be no doubt that this is a mistake. This specimen has the longest tail in proportion to its size of any Indian species of the whole genus, its length being more than six and a half times the distance between the muzzle and the ear, while our longest-tailed specimen of *Vandeleuria oleracea* has it only six and a quarter times.

The palate-ridges (Plate LI. fig. 2) of this species show a slight difference from those of *M. alexandrinus*, there being an incomplete ridge between those answering to the fourth and fifth divided ridges of *M. alexandrinus*, thus making six instead of five divided ridges. This difference, though slight in itself, appears to be constant, as five spirit-specimens all show the extra ridge, while I have seen it

in none of the numerous specimens of *M. alexandrinus* I have examined.

This very handsome Rat may always be readily recognized by its brightly contrasted colours and its long bicolor tail. It is true that many specimens of *Mus fulvescens* have a somewhat similarly coloured body; but they always have the lower side of the tail of the same tint as the upper.

I have placed "*Mus octomammis*," here rather than under *M. fulvescens*, for the reasons already mentioned under that species.

The distribution of *M. jerdoni* presents some most interesting points. In Mr. A. R. Wallace's recent work, 'Island Life,' the author, when treating of the islands of Formosa<sup>1</sup> and of Java<sup>2</sup>, states that the fauna of each of these two widely-separated places has a noticeable connexion with that of the Himalayan region. Now this species gives us a most interesting instance of the correctness of Mr. Wallace's views. Its headquarters seem to be in the Sikhim region; but a very young specimen collected by Baron A. von Hügel in Java is absolutely the same, it possesses even the minute fifth palate-ridge above mentioned; its fur is somewhat shorter, and, considering its age, more thickly spicuous than is the case in Himalayan specimens; but these differences are only the natural result of a more tropical climate. With regard to Formosa, *Mus coxinga*, Swinh.<sup>3</sup>, of which the types are in the British Museum, is so very closely allied to this species that I was at first disposed to consider it identical; but I now think it just separable on account of its longer hind foot (1.4 against 1.15). We thus have, isolated in these three places, nearly related Rats which seem to be quite unknown in the intermediate districts. *Mus (Nesokia) nemorivagus* presents us with another instance of this sort of distribution, being found in Nepal and Formosa; and if, as is just possible, the true *M. setifer*, Horsf., from Java, is the same, we have a still better example of the relations of these faunas to one another.

*Mus jerdoni* seems to be almost entirely a highland species. Those I have seen have come from Darjiling (7000 ft.), Khasya Hills (4000-5000 ft.), and Willis Mt., Java (3000 ft.). Jerdon<sup>4</sup> mentions specimens from Kunawar (12,000 ft.); but, from the locality, I am inclined to think that they may have been *M. niveiventris*. Dr. Anderson tells me that these Kunawar specimens are not now in the Calcutta Museum; so that the question of the western distribution of this species cannot be settled at present.

When Blyth originally described *M. jerdoni* he stated that the head and body measured 4 inches and the tail  $3\frac{1}{2}$  inches; proportions wholly at variance with those given above; but I am informed by Dr. Anderson that the type is only half-grown, and that specimens in the Calcutta Museum, undoubtedly identical, measure just about what those do of which the dimensions are given. Mr. Blyth described this Rat as a species of the subgenus *Leggada*, on account

<sup>1</sup> Chap. xviii. p. 375.

<sup>2</sup> Chap. xvii. p. 358.

<sup>3</sup> P. Z. S. 1864, p. 185 (misprinted *coninga*, see P. Z. S. 1870, p. 636).

<sup>4</sup> Mamm. Ind. p. 209 (1867).

of its spiny fur; it is, however, a true *Mus*, and has no connexion with the species of *Leggada*, the presence of spines being in no way an essential character of that subgenus.

With regard to these spines, our series of *M. coxinga* from Formosa shows every stage, from a specimen almost entirely spineless to one so thickly covered with spines that there are hardly any hairs. Mr. Swinhoe, in his original description, stated that the number of spines depended on age, the older specimens having the greater number; but I think season has quite as much to do with it, as we find specimens with the spines irregularly distributed in patches, as if these specimens were changing their fur with the season. This patchy arrangement, as far as one can see, could never obtain if the spines increased regularly in number according to the age of the individual. It seems probable, however, that both age and season have some connexion with the number of spines developed.

By the examination of such a series as that of *M. coxinga* and others, we are irresistibly led to the conclusion that the presence of spines in the fur, far from being a character of generic, or subgeneric, is not even of specific importance. Dr. Jentink, of the Leyden Museum, has recently<sup>1</sup>, when describing various new species of *Mus*, divided the species primarily into those with spines and those without, laying great stress on this character. But I differ entirely from him as to its value; for not only have I seen, of the following Indian species, specimens both with and without spines—*M. alexandrinus* var. *nitidus*, *M. fulvescens*, *M. niveiventer*, *M. nitidulus*, and *M. (Leggada) buduga*,—but I have also observed the same thing in two Fijian specimens of *M. exulans*, Peale, and in the Central-American genus *Heteromys*, which normally has the fur altogether spinous.

On the whole, therefore, I am inclined to think that in all tropical countries, where the seasons of the year are tolerably well marked, a development of spines takes place in the summer, these falling off again in the winter. Spines are presumably a much cooler covering than hair, as all of the numerous spiny Rodents known are inhabitants of tropical or subtropical countries, and none of places with a distinctly cold climate.

It is worthy of notice that it seems to be the species with the finest and softest hair which have the greatest tendency to the development of spines. Thus the coarse-haired Rats, such as *Nesokia bengalensis*, *M. decumanus*, and *M. alexandrinus* var. *rufescens*, seldom appear to produce true spines; while, on the other hand, the fine-haired var. *nitidus*, *M. fulvescens*, and *M. coxinga* are at times the most spiny of all.

#### 9. *MUS NIVEIVENTER*.

\**M. (Rattus) niviventer*, Hodgs. J. A. S. B. v. p. 234 (1836).

*M. niviventer*, Hodgs. Ann. & Mag. Nat. Hist. xv. p. 267 (1845); Gray, Cat. Hodgson's Coll. (1) p. 18 (1846).

*Hab.* The region bordering the Himalayas, from Simla to Katmandu; Darjiling (*Jerdon*)?

<sup>1</sup> Notes from the Leyden Museum, i. p. 7 (1878).



Fur rather coarse and short, sometimes thickly mixed with flattened spines, sometimes almost entirely without them. General colour above grey, with a tinge of yellow. Hairs dark slate-colour for nine tenths of their length; the tip in some yellow, in others black. The black-tipped hairs, which seem to be the coarser of the two, are more numerous in the centre of the back, so that that part is darker than the sides. Spines, when present, white, with black tips. Belly hairs and spines pure white to their roots, the line of demarcation sharply defined. Tail rather longer than the head and body, sharply bicolor, grey above and white beneath; hairs on its distal quarter slightly elongated.

With regard to the measurements I can only give approximate ones, as I have not seen any specimens of this species in spirit. The following given by Hodgson appear to be about the average:—Length, head and body 5·25, tail 6·0, hind foot 0·92. Blyth's two Másurí specimens were larger, viz. head and body 6·0 and 7·0, tail 7·0 and 7·5 in. respectively. These dimensions are sufficient to show that the tail is never so very much longer than the head and body as it is in *M. jerdoni*, from which this species may also be readily distinguished by its grey instead of rufous colour. The yellow mentioned in the description seems quite to correspond with the orange-red of *M. jerdoni*, occurring on the same parts of the hairs, and becoming clearer on the sides, in both species.

The skull, as was to be expected, is extremely like that of *M. jerdoni*, the only difference that I can perceive being that the nasal portion is somewhat more elongated in the present species.

This seems to be a rather scarce Rat, as Hodgson says of it, "of rare occurrence;" and the only specimens I have seen are five of his original series caught in the Residency house, Katmandu, and one collected at Simla by Mr. Blanford. Jerdon<sup>1</sup>, however, says that he found it "very common at Darjiling;" but I am inclined to doubt his determination, as there are no specimens among the large series of Darjiling Rats collected by Mr. Blanford, while *M. jerdoni* is commonly found there, and might possibly have been mistaken for it.

#### 10. MUS BLANFORDI. (Plate L.)

\**Mus blanfordi*, Thomas, Ann. & Mag. Nat. Hist. (5) vii. p. 24 (1881).

*Hab.* Kadapa, Madras (*Beddome*).

Since my original description of this species was published we have been fortunate enough to receive a second specimen of it, also collected at Kadapa by Col. Beddome, and presented by him to the British Museum. This individual is a fully adult male, preserved in spirit, and is so very much larger than the type as to show that the latter, though its teeth were fully grown up, yet cannot have been quite full-grown. A few of the characters before given have therefore been found to be due to the immaturity of the specimen, and have had to be modified accordingly. The following description

<sup>1</sup> Mamm. Ind. p. 200,

is based on both specimens, and ought therefore to be fairly complete :—

Fur long and soft, above slate-coloured for seven eighths of its length, the terminal eighth being greyish fawn. The greater part of the belly is pure white in both specimens; but it is probably sometimes dark, as there is an indication of this colour on the centre of the chest in each case, as in certain specimens of *M. alexandrinus*. The tail is very much longer than the head and body; for half its length it is above and below dark-coloured and short-haired, as in other Rats; but then its colour abruptly changes to white all round, and the hairs gradually lengthen from this point and form a white brush at the tip. Dr. Scully's Gilgit specimens of *M. alexandrinus* have their tails much more hairy than is usual in that species; but in their other characters they in no way resemble *Mus blanfordi*.

The feet are entirely white in the adult male; but in the female there is a distinct brown tinge on the upper surface of both fore and hind feet; this, therefore, is no doubt variable.

The hind foot (Plate LI. fig. 6) is of somewhat different proportions from those which obtain in the other Indian Rats, the tarsus being somewhat long, while the phalanges are particularly short. The proportional lengths of the toes are much as in *Mus alexandrinus*, except in the case of the fifth digit on both fore and hind feet, which is rather longer as compared with the fourth. The pads are large and rounded, and, in the hind feet, somewhat crowded together, as shown in the figure.

The ears are large and dark-coloured. On their outer side the anterior half is thickly covered with short brown hairs, the posterior half being very nearly naked. On the inner side the hairs are much fewer and shorter than on the outer, and are mostly confined to the posterior half. In the original description the ears were said to be "nearly naked;" but this condition in the type was probably owing to the rubbing the ears had received in the taking-out of the skull.

As far as I can discover, there are only six mammae in the female—one pair almost in the axillae, and two pairs close together in the inguinal region.

The intestines have unfortunately been removed from both specimens, so that I have not been able to examine the caecum.

#### Measurements.

	Ad. ♂.	♀ (type).
Head and body .....	6·0	4·1
Tail .....	8·0	6·1
Hind foot.....	1·33	1·2
Forearm and hand .....	1·6	1·3
Ear-conch, length .....	..	·7
Muzzle to ear .....	1·5	..

It will thus be seen that, by its external characters only, *M. blanfordi* is a most distinct species, its whole appearance being quite different from that of any other Rat that I have seen. Its large

ears, long soft fur, white belly, and especially its long, white-tipped, hairy tail, cause it to be distinguishable at the first glance from all other Indian Muridæ; and I have had great pleasure in connecting with it the name of Mr. W. T. Blanford, to whose generosity in presenting to the British Museum his fine series of Indian Muridæ in spirit, and in lending me all his Indian skins, I owe the fact of my having been so far able to work out the Indian species of this most difficult genus of Mammals.

The skull of this species (Plate LI. figs. 4 & 5) is very distinct from that of *M. alexandrinus*. The following are the dimensions of the skull of the adult male of *M. blanfordi* and of that of a specimen of *M. alexandrinus* var. *rufescens*, which, being of precisely the same length, is particularly suitable for the purpose of comparison:—

	<i>Mus blanfordi</i> ♂. Kadapa.	<i>Mus rufescens</i> <sup>1</sup> ♂. Calcutta.
Total length.....	1·65	1·65
Greatest breadth.....	·8	·8
Length of lower jaw <sup>2</sup> .....	·96	·96
Nasal bones.....	·68	·58
Breadth between orbits....	·28	·26
Anterior palatine foramina..	·35	·30
Incisors to 1st upper molars..	·44	·44
Breadth of interparietal....	·45	·41

The proportions of the two skulls would thus seem to be almost exactly the same, that of *M. blanfordi* having rather longer anterior palatine foramina, and broader interparietal bones. The following differences, however, form a ready means of distinguishing the skulls of the two species:—

In *M. rufescens* the fronto-parietal sutures form together a very obtuse angle forward, sometimes almost a straight line across the skull; but in *M. blanfordi* they form but little more than a right angle, the frontal extending in the middle line much further backwards between the parietals.

The shape of the interparietal bone is very different in the two skulls. In *M. rufescens* it is more or less five- or six-sided, with the angles well developed; but in *M. blanfordi* the bone, as may be seen in the figure, has only two distinct angles, namely those at the outer ends of the bone, its front and back edges being simple curves.

In the above-mentioned points the two skulls of *M. blanfordi* both agree perfectly; but one of the characters mentioned in the original description is now found to be a question of age. This is the shape of the front edge of the anterior zygoma-root, which was said to be slanting instead of perpendicular. The older skull, however, has this edge quite upright, as in other Rats; and I have therefore had

<sup>1</sup> This term is here used instead of the more correct form *Mus alexandrinus*, var. *rufescens*, as being more convenient for ordinary use.

<sup>2</sup> From the condyles to the most anterior point of the actual bone.

the lateral view of the skull (Plate LI. fig 4) redrawn from the adult specimen, in order that the properly developed form might be shown. The figure of this species (Plate L.) is taken from the immature specimen. There are, however, scarcely any extreme differences between the two individuals, except that of size.

The teeth of *M. blanfordi* seem to be somewhat broader than in *M. alexandrinus*; and in this respect they resemble those of *M. mettada*.

# 11. MUS URBANUS.

\**Mus musculus*, Ell. Madr. Journ. x. p. 214 (1839).

\**Mus nepalensis*, Hodgs. J. A. S. B. x. p. 915 (sine descr.) (1841).

\**Mus manei*, Gray, Cat. Mamm. B. M. p. 111 (sine descr.) (1843).

\**Mus urbanus*, Hodgs. Ann. & Mag. N. H. xv. p. 269 (1845).

\**Mus dubius*, Hodgs. t. c. p. 268 (1845).

\**Mus homourus*, Hodgs. t. c. p. 268 (1845).

\**Mus darjeelingensis*, Hodgs. op. cit. iii. p. 203 (1849) (sine descr.); Horsf. Cat Mus. E. I. C. p. 143 (descr. orig.) (1851).

*Mus tytleri*, Blyth, J. A. S. B. xxviii. p. 296 (1859).

\**Mus rama*, Cant., Blyth, J. A. S. B. xxxiv. pt. 2, p. 194 (1865).

*Hab.* The whole of India, in houses. Malacca (*Cantor*).

Fur short, crisp, quite spineless. General colour varying from bright fawn to dark rufous-brown; belly but little lighter, never white as in *M. bactrianus*. Hairs all over the body slate-coloured for three fourths of their length; then follows a yellow or orange-coloured tip. On the back there is a certain admixture of black-tipped hairs, which, however, are absent in the brighter-coloured specimens. Tail generally decidedly longer than the head and body, sometimes only just about equal, brown, more or less paler beneath. Ears short, rounded. Mammæ 10, three pectoral and two inguinal pairs. Cæcum of medium length and not very markedly curled round, 0.56 in. long in an adult male.

## Dimensions.

	Nepal ( <i>Hodgson</i> ).		Darjiling ( <i>Blanford</i> ).	Ceylon.
	a. ♂.	b. ♀.	c. ♂.	d. ♀.
Head and body . . . . .	2.6	3.0	3.05	3.0
Tail . . . . .	3.27	3.23	3.20	3.54
Hind foot . . . . .	.65	.67	.69	.68
Forearm and hand . . . .	.74	.80	.80	.79
Ear-conch, length . . . .	.40	.40	.45	.43
Muzzle to ear . . . . .	.67	.75	.76	.76

This species, to which such a large number of names have been given, seems to be the common house-mouse of the whole of India and even of Malacca, as the *Mus rama*, Cant., of Blyth is undoubtedly referable to it, as proved by the type. Blyth and, following him, Jerdon considered that there were at least two species of house-mouse in India—the one, *Mus homourus*, Hodgs., being that of the Himalayan region, and the other, *M. urbanus*, that of the plains;

but I can find no difference of any importance between the Mice of Darjiling and Katmandu and those of Southern India. Of course, as might be expected, specimens from the hills have rather longer and softer fur and darker coloration than those of the plains; but this is only a parallel case to that of *Mus alexandrinus*, which, as shown above, becomes redder and coarser-haired the further south it lives.

With regard to the distinctness of *M. urbanus* from *M. musculus*, Blyth said that "*M. musculus* has conspicuously larger ears, much smaller eyes, broader paws, and the tail is one fourth shorter, measuring 3 inches in *musculus* and 4 in *urbanus*. The fur, again, is of very different texture." Now I am by no means so satisfied of the distinction of these two forms as Blyth seems to have been. *M. urbanus*, it is true, has on the average somewhat smaller ears; but the difference is extremely small, and the measurements intergrade completely. The stated difference in the size of the eyes must have come solely from the manner of preservation of the specimens compared; probably Blyth's *urbanus* was fresh, while his *musculus* was in spirit, which would quite account for the difference. As to the lengths of the tail, 3 and 4 inches respectively, I can only say that I have never seen a spirit-specimen of *urbanus* with the tail more than 3·5 inches, the average being considerably less; and many specimens of *musculus* have it from 3·2 to 3·4 inches; so that we see that, as far as regards the more essential characters of the dimensions of the members, the two forms cannot possibly be separated. However, the fur in *urbanus* is always much shorter, and the colour much paler than in *musculus*; so that specimens can always be placed without difficulty under one or other heading; and therefore I provisionally retain *M. urbanus* as a good species, its most marked distinctive characters being its fawn or reddish coloration and its short crisp fur.

I do not think it is necessary to discuss the names put as synonyms in detail: the types of all of them except *M. tytleri* are in the British Museum; and I have not the smallest doubt in the case of any one of these. The type of *Mus rama* from Malacca is of quite the usual character, and might almost have belonged to the same litter as that of *M. manei* from Madras.

With regard to *M. tytleri*, we have a specimen, also from the Dehra Doon, which fairly answers to Blyth's description, and which I assign to this species. It is the very palest specimen I have seen, quite as pale as *M. bactrianus*; but its belly is scarcely lighter than its back, while that of *M. bactrianus* is pure white. Moreover we have a similarly pale specimen from Calcutta. Dr. Anderson tells me that the type of *M. tytleri* is not in the Calcutta Museum; so that we have only Blyth's description to go upon; I think, however, that I am correct in referring it to *Mus urbanus*.

*Mus sublimis*, W. Blanford,<sup>1</sup> seems to be allied to this species; but without seeing specimens I cannot express any opinion as to its

<sup>1</sup> Zool. Yarkand Exp., Mamm. p. 51, 1879.

position. The type, and only known specimen, was obtained at Tankse, Pankong Lake, Ladak, at a height of 13,000 feet.

## 12. *MUS BACTRIANUS*.

\**M. bactrianus*, Blyth, J. A. S. B. xv. p. 140 (1846); Blanford, Zool. East Pers. i. p. 56, pl. v. fig. 2 (1876); Danf. & Alst. P. Z. S. 1880, p. 61.

*M. gerbillinus*, Blyth, J. A. S. B. xxii. p. 410 (1853); Cat Mus. As. Soc. p. 119 (1863).

*M. theobaldi*, Blyth, J. A. S. B. xxii. p. 583 (1853).

*Hab.* N.W. India and Cashmere, and westwards to the Euphrates (*Danford and Alston*); Palestine (*Brit. Mus., Tristram*); Muscat, Arabia (*Blanford*).

Fur rather short and crisp; above sandy fawn, the bases of the hairs slate-colour; below usually pure white, but with sometimes a slight basal tinge of slate, especially in immature specimens. Ears rather shorter than in *M. urbanus*, covered inside and out with sandy-brown hairs. Tail about the length of the head and body, or as a rule rather longer, brown above and white beneath, the difference, however, not being strongly marked. Cæcum simple, about 0·7 inch long. Mammæ 10, three pectoral and two inguinal pairs.

The type has a more reddish coloration than usual on the upper side; but otherwise it is similar to Persian and Syrian specimens.

The skull presents no characters worthy of remark, being almost exactly like that of *Mus musculus*. In immature specimens it is much more convex above than it is later, and the nasal region is shorter.

## Dimensions.

	Baluchistan.	Karachi.	Palestine.	Sind.
	a. ♂.	b. ♂.	c. ♀.	d. imm. ♂.
Head and body . . . . .	3·4 <sup>1</sup>	2·40	2·70	2·0
Tail . . . . .	3·55	3·23	2·90	2·45
Hind foot . . . . .	·75	·66	·65	·65
Tibia <sup>2</sup> . . . . .	·92	·73	·75	·63
Forearm and hand . . . . .	·90	·73	·75	·69
Ear-conch, length . . . . .	·47	·40	·45	·34
Muzzle to ear . . . . .	..	·70	·73	·62

This species is always readily distinguishable from other Indian Mice by its pale colour and white belly. It would appear to be a true desert form, having the coloration peculiar to the inhabitants of sandy plains and being found only in districts where such plains form a large part of the country.

Messrs. Danford and Alston (*l. c.*) give the dimensions of two spirit-specimens taken at Oroul on the Euphrates; but I should imagine that there has been some misprint among the figures, as I

<sup>1</sup> Skull extracted.

<sup>2</sup> From the *upper* side of the knee-joint to the sole.

have never seen a specimen, preserved in spirit, in which the tail was considerably shorter than the head and body, as it is there stated to be. One of this very series, moreover, is in the British Museum; but it is only a much stretched skin, in which, nevertheless, the tail is but little shorter than the head and body.

It will be seen by the table of measurements that in all the adult specimens the hind foot is considerably shorter than the tibia, but in an immature specimen (*d*) it is longer. This difference, combined with the more dusky belly and more convex skull, inclined me at first to consider this Sind specimen, and another quite agreeing with it from Muscat, a distinct species; but I now believe that these differences are only due to immaturity. It is true that in both specimens all the molars are fully grown up into their places; but they are not worn at all, as are those of the other specimens measured.

### 13. *MUS CERVICOLOR*.

\**Mus cervicolor*, Hodgs. Ann. & Mag. N. H. xv. p. 268 (1845).

*M. strophiatatus*, Hodgs. loc. cit. (1845).

?*M. albidiventris*, Blyth, J. A. S. B. xxi. p. 351 (1852).

*Hab.* Nepal; Calcutta<sup>1</sup> (*Blyth*).

"Abundant in cultivated fields of the valley of Nepal" (*Hodgson*).

Fur above and below slate-coloured for three fourths of its length, the tips being above pale fawn, quite hiding the slate, and below white. Ears rather large, rounded, covered on both sides with very short shining hairs. Tail usually about equal to the body alone, without the head, by which character this species may be readily distinguished from all other Indian Mice, with the exception of *M. (Leggada) buduga* (q. v.). Cæcum short, pouch-like, bent round upon itself. Mammæ 10, three pectoral and two inguinal pairs.

The skull, viewed from the side, seems to be more flattened than usual in the frontal and nasal regions. On the whole it is similar to that of *M. (L.) buduga*; but this flattening is much more strongly marked in *M. cervicolor*, *L. buduga* having a distinct convexity of the outline just in front of the orbits.

#### *Dimensions.*

	Nepal ( <i>Hodgson</i> ).	
	a. ♂.	b. ♀.
Head and body .....	2·9	2·9
Tail .....	2·8	2·65
Hind foot .....	·65	·64
Forearm and hand .....	·80	·80
Ear-conch, length .....	·45	·49
Muzzle to ear .....	·82	·80

<sup>1</sup> ? *Leggada buduga*, Gr.

This species seems to be most nearly allied to *Leggada buduga*, Gr., the description of which (p. 553) should be carefully examined before any specimen is set down as the present form, which is much rarer and apparently almost confined to Nepal and the neighbouring region.

With regard to the identity of *Mus strophiatatus* with this species I think there can be but little doubt. Hodgson's drawing of *M. cervicolor* represents two specimens, with the following notes attached:—"Male's colour darker and duller, female's lighter and purer." This distinction, which Hodgson, when the drawing was done, thought to be sexual, he later founded *M. strophiatatus* upon, as there is a second note on the same drawing to the following effect: "There are two species, 1st, duller hued and ungorgetted; 2nd, brighter and gorgetted." This "gorget" is merely the extension upwards on the neck of the light breast-colour, a character of no value whatever, as far as I can judge by the specimens presented by him; and the difference in brightness seems to be very slight. We have not any specimens named *M. strophiatatus*; but one of those sent as *cervicolor* agrees very fairly with his figure and description of that animal.

*Mus albidiventris* was referred to this species by Blyth himself in his memoir; it seems possible, however, that it is another synonym of *M. buduga*, which is very closely related to this species, and which is more likely to be found in Calcutta.

It is very probable that *M. cunicularis*, Blyth<sup>1</sup>, from the Khasi Hills, is a synonym of *M. cervicolor*, the description agreeing very fairly, though the colour would seem to be somewhat darker; this, however, can only be settled by a reference to the types.

#### 14. *MUS ARIANUS*.

*Mus sylvaticus*, L., De Fil. Viagg. Pers. p. 344 (1865).

\**Mus erythronotus*, W. Blanford, Ann. & Mag. N. H. (4) xvi. p. 311 (1875); East Pers. ii. p. 54, pl. v. fig. 3 (1876); Zool. Yark. Exp. Mamm. p. 54 (1879), nec Temm. Faun. Japon. Mamm. p. 50 (1850).

\**M. arianus*, W. Blanford, Ann. & Mag. N. H. (5) vii. p. 162 (1881).

*Hab.* Eastern Persia (Blanford), Gilgit, Cashmere (Scully), Kashghar and Wakhan (Stoliczka).

Fur soft, without spines; above dark red, the basal three fourths of the hair dark slate-colour. Belly white. Mammary 6, one pectoral and two inguinal pairs. Tail slightly longer than the head and body, brown above, white beneath. Ears long; laid forward they reach quite to the eye. Cæcum quite simple and rather long, measuring 1.3 inch in specimen *a*.

<sup>1</sup> J. A. S. B. xxiv. p. 721 (1855).



## Measurements.

	Types, Kohrud, Persia <sup>1</sup> .		Gilgit ( <i>Dr. Scully</i> ).		
	<i>a. ♂.</i> in.	<i>b. ♀.</i> in.	<i>c. ♂.</i> in.	<i>d. ♀.</i> in.	<i>e. ♀.</i> in.
Head and body .....	3·6	( <i>c</i> ) 3·5	3·55	3·40	3·67
Tail .....	4·0	3·9	4·05	3·95	4·1
Hind foot .....	( <sup>2</sup> )	·82	·86	·82	·84
Forearm and hand .....	·95	·94	·98	·95	·96
Ear-conch, length...	·55	·53	·54	·54	·54
Muzzle to ear .....	( <i>c</i> ) ·89	.....	·90	·90	·92

This species is so very closely allied to the common *Mus sylvaticus*, L., that I think it is extremely doubtful whether it is more than a variety of that species. The external characters (size, colour, and proportions), with one exception, are identical with those of English specimens of *M. sylvaticus*; the one exception is the length of the hind foot, which in *M. sylvaticus* is remarkably long, much more so than is usual among the species of restricted *Mus*, while in *M. arianus* this part is only of normal length. Thus, the hind foot of true *M. sylvaticus* is distinctly longer than the distance between the muzzle and ear, while, as shown by the measurements given above, that of *M. arianus* is always shorter. The following are these two measurements in five English specimens of *M. sylvaticus* :—

Hind foot.....	·90	·88	·90	·87	·85
Muzzle to ear ..	·86	·81	·84	·84	·77

These dimensions show that, in English individuals at least, the comparative proportions of the hind foot are very different from those of *M. arianus*; but I have not been able to examine any properly-preserved specimens from intermediate localities, so that I cannot give a definite opinion as to the constancy of this character.

With regard to the skull, Mr. Blanford, in his Zoology of the Yarkand Mission, has discussed the question of the relationships of these two forms. He there states that in *M. arianus* the occipital portion of the skull is lower, as also is the foramen magnum, the opening of the posterior nares is broader, and the last upper molar is larger than in *M. sylvaticus*. On comparing the typical skull of *M. arianus* with a series of skulls of *M. sylvaticus*, I find that a Lanarkshire specimen has a lower occipital region, and that of several British specimens some have higher and some lower occipital foramina. With regard to the other characters certain specimens approach *M. arianus* very closely, though none quite equal it.

<sup>1</sup> The dimensions given by Mr. Blanford, being those of the specimens when fresh, are not suitable for comparison with those of specimens preserved in spirit. I have therefore re-measured the types in the British Museum.

<sup>2</sup> The hind feet of this specimen have been broken. Mr. Blanford gives their length as ·9; but this, I believe, includes the claws, though he unfortunately does not mention whether it is so or not.

After describing these differences, Mr. Blanford himself says:—  
 “It is, however, by no means improbable that *M. erythronotus* (*M. arianus*) is merely a local race of *M. sylvaticus*; and, with a good series of specimens from various localities, the two might be found to pass into each other.”

On the whole I think that *M. arianus* will be found to represent a short-footed eastern variety of *M. sylvaticus* worthy of a varietal name, but not distinct enough to merit specific separation.

De Filippi's "*Mus sylvaticus*, L." is no doubt this short-footed form, and not the true European *M. sylvaticus*.

This species is really a Palearctic and not an Oriental form. It only just crosses the extreme northern limits of our region, the only Indian locality for it being Gilgit, North Cashmere, where Dr. Scully obtained several specimens.

### 15. *MUS NITIDULUS*.

*Mus nitidulus*, Blyth, J. A. S. B. xxviii. p. 294 (1859).

*Hab.* Schwe Gyen, Sitang R., Pegu (*Berdmore*); Darjiling (*Blanford*); Sikhim, "mountains 4500 feet" (*Argent*).

Fur long, sometimes spiny, dark slate-colour for nine tenths of its length, then yellowish grey, with the extreme tips black. Tail slightly longer than the head and body, brown above and white below. Hind foot much longer than in *M. urbanus*, exceeding the distance between the muzzle and the ear, as in true *M. sylvaticus*, L. (see p. 549). Skull with the front edge of the outer wall of the infraorbital foramen strongly slanting<sup>1</sup> (Plate LI. fig. 8), all the other Indian species, when adult, having this edge perpendicular, or even curving beyond its base. Cæcum short, 0·52 inch in length.

The following are the dimensions of our only spirit-specimen, an adult female, in which, however, I cannot make out the number of mammae:—Head and body 3·0, tail 3·58, hind foot ·80, forearm and hand ·88, ear-conch length ·50, nose to ear ·77.

This species, to which I refer two of our Indian Mice, was described by Blyth from Pegu; he did not mention the peculiarity of the wall of the infraorbital foramen; but the description of the external characters agrees very closely.

Our two specimens of this species present another example of the uselessness, as a specific character, of the presence or absence of spines in the fur—one of them, the specimen measured, having its fur rather soft, and almost entirely spineless, while the other has its fur nearly wholly composed of spines, quite as much as in average specimens of *Leggada platythrix*.

### 16. *MUS METTADA*, Gr.

\**Golunda mettada*, Gray, Charlesw. Mag. N. H. i. p. 586 (1837).

\**Mus lanuginosus*, Ell. Madr. Journ. Lit. Sci. x. p. 212 (1839).

<sup>1</sup> This same peculiarity in *M. blanfordi* was found to be due to immaturity; but in this species it appears to be an adult character, as both of the above-mentioned specimens are not only full-grown, but even aged, their teeth being quite worn down.

*Mus mettada*, Blanford, J. A. S. B. xlv. (2) p. 290, pl. i. (skull, foot, &c.) (1877).

"*Metád*" of Tank-diggers.

*Hab.* Madras Presidency.

Fur long, soft, and spineless. General colour above grey, below white. Hairs above dark slate-colour for seven eighths of their length, then yellowish white, the extreme tips black or dark brown; some have all the distal quarter of the hair black; these darker hairs, as usual, are more numerous along the centre of the back. Belly-hairs slate-colour for their basal three fourths; the tips white, hiding the slate. The line of separation between the upper and lower colours, as a rule, is not well marked.

Mammæ 8, two pectoral and two inguinal pairs. Tail about the length of the head and body, varying, in our specimens, from a  $\frac{1}{4}$  of an inch longer to  $\frac{1}{2}$  an inch shorter. Hairs on the tail numerous, rather longer than in most other species, but not forming a pencil at the tip; colour brown above and white below. Ears large, rounded, clothed inside and out with short shining hairs. Feet white or pale brown. Cæcum wide and rather short, measuring just an inch in the only specimen (an adult male) in which it has been preserved. The skull has been so well figured and described by Mr. Blanford (*l. c.*) that there is no need for me to enter into any details concerning it.

#### *Dimensions.*

	Ahmednagar.	Madras.
	<i>a. ♂</i>	<i>b. ♂.</i>
Head and body . . . . .	4·5	4·56
Tail . . . . .	4·2	4·70
Hind foot . . . . .	1·0	1·05
Forearm and hand ..	1·25	1·30
Ear-conch, length ....	·60	·60
Nose to ear . . . . .	1·15	1·15

There are, as usual, five pads on the fore feet; but on the hind feet a most remarkable difference is observable. All other species of the genus that I have ever seen, have six well-defined pads, the last always strongly marked, linear in the Rats and circular in the Mice; but in this species the sixth pad is always, and the fifth frequently, suppressed. Of eight spirit-specimens that I have examined, three have only four, with the position of the fifth very faintly indicated in one of them; the other five (the specimens from Ahmednagar referred to in Mr. Blanford's paper) have five well-defined circular pads. In one of these last there is an extremely faint indication of the normal sixth pad; but so faint is it that a lens is needed to make out its limits at all.

This suppression of the hinder foot-pads is, judging from analogy, most probably owing to the *Metád*'s habitually moving and sitting, more or less, like a Jerboa, because we find that, in all genera doing this, the foot-pads are either suppressed behind or

crowded together in the front part of the sole. The extreme of this suppression is represented by the Common Jerboa (*Dipus jaculus*), which has only one hind foot-pad; *Gerbillus* has four, all close together at the roots of the toes; and *Zapus* (the North-American "Jumping-Mouse") has five. The members of these genera are all well known constantly to rest on the front part of the hind foot, and not to be in any way plantigrade, as are the Muridæ with six well-developed hind foot-pads; we are therefore, I think, justified in considering the Metad as showing the commencement of a similar differentiation, which, however, has not gone nearly so far as in the others. *Mus blanfordi* has its foot-pads rather crowded together in the front of the foot; so that it is possibly also rather less plantigrade than usual.

As to the affinities of this animal (which seems to be somewhat isolated from the other Indian species), it may be seen by the synopsis on p. 531, that the only character, apart from size, by which to separate the Rats from the Mice is the very different shape of the sixth hind foot-pad; and therefore the rudiment of this pad, mentioned above as occurring in one of our specimens, will be of service to us. This rudiment is very nearly circular; and therefore, as far as we can rely on any one character, even though nearly universal in its application, we may, for the present, consider *Mus mettada* a large Mouse rather than a small Rat.

#### Subgenus LEGGADA.

*Leggada*, Gray, Charlesw. Mag. N. H. i. p. 586 (1837).

*Nannomys*, Peters, Monatsb. Acad. Berl. p. 480 (1876).

First upper molars with an extra cusp on their front edge (see Plate LI. figs. 10, 11). Fur more or less spiny.

*Hab.* India and Africa.

This subgenus was founded by Gray on his *Leggada budaya*, and was also stated to include Bennett's *Mus platythrix*. It has hitherto been considered to be confined to India; but Dr. Peters's careful description of his subgenus *Nannomys* shows most conclusively that it is identical with *Leggada*; in fact, his characters are the very same as Dr. Gray's, except that he lays rather more stress on the presence of spines in the fur.

The types of *Mus minutoides*, Smith<sup>1</sup>, from South Africa, preserved in the British Museum, certainly belong to this subgenus; and so, with Dr. Peters's two species, *M. minimus*<sup>2</sup> from Mozambique, and *M. setulosus*<sup>3</sup> from the Cameroons, we have three species of *Leggada* recorded from Africa; and there is no doubt that more still remain to be described when that continent is further explored. Some of the African species already described will probably also turn out to be members of this subgenus.

The presence of this form in Africa was quite to be expected,

<sup>1</sup> S. Afr. Quart. Journ. ii. p. 157 (1835).

<sup>2</sup> Reise nach Mossambique, p. 153 (1852).

<sup>3</sup> Monatsb. Ak. Berl. 1876, p. 480.

considering the large number of murine types common to the Ethiopian region and the peninsula of India.

The only Indian species certainly belonging to this subgenus are the two following:—

#### 17. MUS (LEGGADA) PLATYTHRIX.

\**Mus platythrrix*, Benn. P. Z. S. 1832, p. 121 (1832).

*Leggada platythrrix*, Gray, Charlesw. Mag. N. H. i. p. 586 (1837).

*Hab.* The peninsula of India, south of the Nerbudda.

Fur above and below composed almost entirely of flattened spines. General colour sandy brown above, white below, the line of demarcation well-defined. Above, the hairs and spines are pale slate-coloured for about half their length; there is then a subterminal ring of yellow, gradually darkening to the extreme tip, which is nearly black. Ears short, rounded, slate-coloured. Tail only the length of the body without the head; covered above with brown, and below with white hairs. Mammæ 10, three pectoral and two inguinal pairs. Hind feet short, with six pads, which are all small and circular (Plate LI. fig. 12). The type, as is shown by the measurements given below, has a considerably longer tail than any other specimen that I have seen, but is otherwise similar to the rest. Skull with the anterior palatine foramina very long, extending to the middle of the first molar; anterior edge of the zygoma-root perpendicular.

For measurements, see Table, p. 556.

This species is a well-marked form, and cannot be confounded with any other. It always possesses the extra cusps to the front upper molars characteristic of the subgenus, while, as mentioned below, *L. buduga* is frequently without them. Sir Walter Elliot (*l. c.*) has given a full account of its manner of life, which seems to be entirely that of a burrowing animal.

The other Indian *Leggada* is far smaller, and has not by any means such a simple history, having been given several different names, as may be seen by the following synonymy.

#### 18. MUS (LEGGADA) BUDUGA.

\**Leggada booduga*, Gray, Charlesw. Mag. N. H. i. p. 586 (1837).

\**Mus lepidus*, Ell. Madr. Journ. Lit. & Sci. x. p. 216 (1839).

*Leggada lepida*, Blyth, J. A. S. B. xxxii. p. 350 (1863).

*Mus terricolor*, Blyth, J. A. S. B. xx. p. 172 (1851).

*Mus fulvidiventris* et ? *M. albidiventris*, Blyth, J. A. S. B. xxi. p. 351 (1852).

\**Mus beavani*, Peters, P. Z. S. 1866, p. 559 (1866).

"*Buduga*" of the tank-diggers, *fide* Elliot *l. c.*

*Hab.* Continental India, south of the Ganges and Indus, and Ceylon.

Fur rather short and crisp, sometimes mixed with very fine flattened spines, sometimes quite without them. Colour above pale

sandy brown, the basal halves of the hairs slate-colour. Below, the hairs are pure white, sometimes quite to their roots; sometimes the basal halves are slate-colour; and there is every stage between the two. Tail generally nearly equal to the head and body, rarely just exceeding them, covered with hairs which are much shorter than in *L. platythrix*. Mammæ 10, three pectoral and two inguinal pairs. Hind foot-pads six, small, circular. Ears small, oval; laid forward they just reach to the eye. Cæcum short and pouch-like.

For measurements see Table, p. 556.

In this species we find the link which, by way of *Mus cervicolor*, bridges over the space between *Leggada* and *Mus*. *L. platythrix* is strongly differentiated, and always shows clearly the extra cusp on the upper molar; but in many specimens of *L. buduga* this cusp is not distinguishable, and these specimens are barely separable specifically from *Mus cervicolor*. Almost the only character to distinguish them is the different length of the ear-conch, which varies from 0.41 to 0.49 inch in *M. cervicolor*, and from 0.32 to 0.39 in *L. buduga*. The colours and other proportions are very similar; and it seems very probable that we shall yet obtain intermediate specimens from the region where the ranges of the two species approximate—namely, in the valley of the Ganges, which seems at present to be the dividing line between the two forms.

With regard to the name which must stand for this species, it unfortunately happens that Gray's barbarous term "*booduga*" antedates Elliot's name *lepida* by two years. We cannot ignore the name *booduga* as barbarous without also doing the same in the case of the Metád, which was called *M. mettada* by Gray and *M. lanuginosus* by Elliot in the same papers in which this species received its two names. I have therefore done what Mr. Blanford did with regard to *M. mettada*<sup>1</sup>—namely, correct Gray's erroneous spelling of the native name, and then use it provisionally until some final understanding is come to with regard to the use of barbarous words as specific names.

*Mus beavani*, Peters, of which the Museum possesses two immature individuals of the typical series, is quite undistinguishable from this species. Our specimens show distinctly the extra cusps on the upper molars; and the proportions are quite the same. The species was described from specimens brought from Maunbhoom by Lieut. Beavan, and would appear to be the true *Mus terricolor*, Blyth, which is said to be "the most common field- and garden-mouse in Lower Bengal." With regard to the specific distinction of this last species, Blyth says:—"This much resembles *M. lepidus*, Ell., in form and colour, but the face is very much shorter, and the fur short, soft, and not spinous in the least degree."

We have seen, by many instances, how utterly valueless the character of the presence or absence of spines is; and in this species, even when well developed, they are by no means stout or conspicuous; and, as far as regards the shortness of the face, I have been quite unable to perceive any thing of the sort in any of our spineless

<sup>1</sup> J. A. S. B. xlv. p. 289 (1877).

Bengal specimens. Moreover Jerdon says<sup>1</sup>:—"A specimen has been sent to Mr. Blyth by Walter Elliot from Southern India, along with a lot of *Mus lepidus*, from which he did not distinguish it." This, of course, is a strong confirmation of my opinion as to the identity of the two forms, since so acute an observer as Sir W. Elliot did not separate them, and they were found together in the same locality. The proportions given by Blyth are moreover precisely the same<sup>2</sup>.

I have also but little doubt that Blyth's *M. fulvidiventr* is also a synonym of this species. When describing it Blyth stated that it was the "*Mus cervicolor*, Hodgs." of Kelaart. Now we have seen how closely allied *L. buduga* and *M. cervicolor* are; and some of our Ceylon specimens are extraordinarily similar externally to that species. Moreover there is nothing in Blyth's description to militate against this conclusion except the stated "rufescent or isabel-line" colour of the belly. This tinge, however, may easily have been the result of the defective preservation of the type, a frequent cause of a more or less yellow instead of white coloration of fur. *M. albidiventr*, Blyth, described at the same time as *M. fulvidiventr*, was later considered by the describer to be a specimen of *M. cervicolor*; but I think it very possible that it may be this species, judging from its locality (Calcutta).

The drawing given of the teeth (Plate LI. fig. 10) has been taken from the actual specimen upon which Gray founded the genus *Leggada*. I have also (fig. 11) had a side view of the first molar of the same specimen taken, showing the extra cusp (*a*) in profile, and, for the sake of comparison, the side view of the same tooth of another equally spiny specimen, which has scarcely a trace of the extra cusp. These two figures show that there is no correspondence between the presence of spines in the fur and extra dental cusps. In fact, in the British-Museum series there are specimens (1) with both spines and extra cusps, (2) with spines and no extra cusps, (3) no spines, but distinct extra cusps, and (4) neither spines in the fur nor extra cusps on the molars.

This series seems to me quite to preclude the possibility of separating these variable Mice into two or more distinct species.

Blyth described two other species as belonging to *Leggada*, namely *L. spinulosa*<sup>3</sup> and *L. jerdoni*. The latter is a good species, of true *Mus*, and has been treated of already (p. 537). The former, however, I am quite unable to identify, though I believe it will turn out also to be a good species, unless *L. platythrix* should be found to occur in the Punjab, in which case it might be only a synonym of that species.

<sup>1</sup> Mamm. Ind. p. 209.

<sup>2</sup> Dr. Anderson has sent two specimens of the true *M. terricolor* from the neighbourhood of Calcutta, expressing at the same time his opinion that that species is distinct from *L. buduga*. These specimens, however, only confirm my opinion as to their identity, agreeing exactly in colour, and being nearly as spiny as the typical specimens of *L. buduga*.

<sup>3</sup> J. A. S. B. xxiii. p. 734 (1854).

Table of Measurements.

	<i>Leggada platythrix.</i>			<i>L. buduga.</i>			<i>L. minutoides.</i>	
	Ad. ♂. Deccan (type).	Ad. ♂. S. India.	Ad. ♀. Madras.	Ad. ♂. Ceylon.	Ad. ♂. Madras.	Ad. ♀. Ajmere.	Dr. Smith's types South Africa.	
Length of head and body	in. 3.3	in. 3.45	in. 3.3	in. 2.8	in. 2.5	in. 2.45	in. 2.15	in. 2.09
" tail .....	3.0	2.55	2.63	2.45	2.45	2.53	1.77	1.75
" hind foot .....	.67	.70	.68	.65	.57	.57	.53	.52
" forearm and hand .....	.90	.92	.84	.76	.71	.65	.62	.61
" ear-conch.....	.39	.46	.45	.39	.38	.37	.31	.33
Breadth of ear-conch ...	.33	.41	.44	.35	.35	.32	.30	.32
Nose to ear .....	.89	.95	.93	.79	.66	.65	.59	.60

## Subgenus VANDELEURIA.

*Vandeleuria*, Gray, Ann. & Mag. N. H. x. p. 265 (1842).

First and fifth toes on both fore and hind feet provided with a short nail instead of a claw (see Plate LI. fig. 13 & 13a). Tail very long.

There is only one undoubted species of this subgenus, of which the following is the synonymy :—

19. *MUS* (VANDELEURIA) *OLERACEUS*.

\**Mus oleraceus*, Benn. P. Z. S. 1832, p. 121 (1832).

\**Mus longicaudatus*, Ell. Madr. Journ. x. p. 94 (sine descr.) (1839).

*Mus dumicolus*, Hodgs. J. A. S. B. x. p. 915 (1841).

*Vandeleuria oleraceus*, Gray, Ann. & Mag. N. H. x. p. 265 (1842).

\**Mus (Vandeleuria) dumeticola*, Hodgs. Ann. & Mag. N. H. xv. p. 268 (1845).

*Mus povensis*, Hodgs. op. cit. p. 269 (1845).

*Mus (Vandeleuria) oleraceus*, Anders. Zool. Yunn. Exp. p. 313 (1878).

*Hab.* Burmah, and all India from Nepal to Madras.

Fur above bright rufous, the roots of the hairs dark slate-colour; belly pure white. Mammæ 8, two pectoral and two inguinal pairs. Tail very much longer than the head and body. Hind foot and pads as shown in Plate LI. fig. 13. An upper view of the fifth toe, on a larger scale, is also given (fig. 13a) to show its very peculiar short nail. The cæcum is unusually large for such a small animal, measuring no less than 1.6 inch in an adult female, in which also the whole length of the intestine from pylorus to anus is just over 13 inches.

This is such a well-marked species, and Dr. Anderson (*l. c.*) has recently so well described it, that I need only give its chief dimensions, taken from the type specimen, an adult male in spirit, collected by Col. Sykes in the Deccan.



Head and body 2·6 inches, tail 4·3, hind foot 0·71, forearm and hand 0·9, ear-conch length 0·46, muzzle to ear 0·75.

I can find no difference of any importance between the types of *V. oleracea* and *V. dumeticola*, Hodgs.; and they appear to be certainly of the same species. The "*Mus dumecolus*, specimen b," of Gray's Catalogue of Hodgson's collection<sup>1</sup>, quite agrees with the latter's description of his *Mus povensis*, and is most probably the actual type.

*Mus nilagiricus*, Jerdon<sup>2</sup>, may possibly turn out to be a second species of this subgenus, but more probably is only a rather large hill-form of this one. The head and body measures 3·5 inches, and the tail 5. The colours seem to be much the same in the two forms.

There now remains but one of Hodgson's species of *Mus* which I have not referred to, namely *M. myothrix*<sup>3</sup>. In his 'Mammals of India'<sup>4</sup> Jerdon has suggested that this species is related to *Golunda ellioti*, Gr. On examining the type of *M. myothrix*, a very bad skin, without the head, I find that there can be but little doubt that it is a specimen of that species, as it possesses the peculiar grooved spines and the hairy tail characteristic of *G. ellioti*, and the colours and proportions appear to be quite the same. It is true that the Gulandi has not hitherto been recorded so far north as this; but there is a specimen in the British Museum, obtained at Dugshai; so that there is nothing surprising in its being found further east in Nepal.

Hodgson has the following notes to his drawings of *M. myothrix*:—"Got at Kahúlia powa, in central region, about 6700 feet;" and "Found on mountain top, in a burrow, whence it was dug out."<sup>5</sup>

#### EXPLANATION OF THE PLATES.

##### PLATE L.

*Mus blanfordi*. The type, a not fully adult female.

##### PLATE LL.

Figs. 1 & 2. Hind foot and palate-ridges of *Mus jerdoni*.

3. Anterior zygoma-root of:—*a*, *Mus alexandrinus*; *b*, *Mus fulvescens*.

4. Side view of the skull of *Mus blanfordi*, taken from a fully adult male specimen.

5. Upper and under views of the skull of the same species. Taken from the type.

6. Right hind foot of *Mus blanfordi* (♂).

7. Left ear of *M. cervicolor*, showing the measuring-points (*a*, *b*).

8 & 9. Skull and right hind foot of *M. nitidulus*.

10. Teeth of *Leggada buduga*, from above, taken from the type specimen.

11. Side view of the first upper molars of two specimens of the same species, showing the variable character of the extra anterior cusp (*a*).

12. Right hind foot of *Leggada platythrix*.

13. Right hind foot of *Vandeleuria oleracea*.

13 *a*. Upper view of the fifth toe of the same foot, much enlarged, showing the peculiar short nail characteristic of the subgenus *Vandeleuria*.

<sup>1</sup> 1st ed. p. 18 (1846).

<sup>2</sup> Mamm. Ind. p. 203 (1867).

<sup>3</sup> Ann. & Mag. N. H. xv. p. 267 (1845).

<sup>4</sup> Mamm. Ind. p. 214.

<sup>5</sup> A full description of *Golunda ellioti* has been published by Mr. Blanford, J. A. S. B. 1876, p. 165, and 1877, p. 292.

4. Note on *Cypræa decipiens*. By EDGAR A. SMITH.

[Received March 23, 1881.]

My description of *Cypræa decipiens* appeared in the Society's 'Proceedings' for 1880, p. 482. At that time only a single specimen was known, and that, unfortunately, in a worn and somewhat bleached state. The British Museum has lately purchased two other examples in most brilliant condition, brought home by the master of a trading vessel from Port Walcot, North-west Australia.

At the time of describing this species I pointed out several distinctions between it and the South-Australian *C. thersites*, which differences are maintained in the two fine shells before me. These are similar in size to the type figured (P. Z. S. 1880, pl. xlviii. figs. 8, 8a), and present the same excessive dorsal humpiness; but their base is scarcely so flattened, the outer lip especially being decidedly rounded. The colour, too, appears to be variable. One specimen has the base perfectly black; and this colour extends up the sides almost halfway to the vertex; and the spotting on the back is much darker than originally described. The second example is greyish brown or mouse-colour at the base, becoming rather darker towards the teeth. The former tint extends only a little way up the sides, and is varied with a few remote irregularly placed roundish dark spots. The upper or dorsal region, however, is like that of its fellow example. The teeth were stated to be about twenty in number; but in these two shells there are two more. The colour of the aperture far within is lilac; and the body-whorl within, beyond the teeth, is brownish white.

It is most satisfactory to obtain two further specimens of a species which, at first sight, so much resembles a dwarfed *C. thersites*; for they not only prove the stability of the species, but at the same time confirm the judgment originally expressed as to its specific distinctness.

## 5. Descriptions of two new Species of Shells from Lake Tanganyika. By EDGAR A. SMITH.

[Received April 16, 1881.]

Mr. Damon, of Weymouth, knowing the interest I have taken in the shells of this lake, has kindly submitted to me for examination a small collection which he recently obtained from this locality. The two species about to be described are the only novelties. These, however, possess much interest because of their relationship to the genus *Tiphobia*. The opercula of the two forms are identical; but the character of the shells is so different that I am inclined to propose a new section, or subgenus, for the reception of the two new ones. These in texture are solid, longitudinally costate and trans-

versely liræ, the points of intersection of the liræ and costæ being more or less granular. The aperture is ovate, and not produced into a canal at the base as in *Tiphobia*; and the columella and upper extremity of the outer lip are connected by a thickish callosity. This division (*Paramelania*) will also include the *Melania nassa* of Woodward, so remarkable for its great variability.

PARAMELANIA, subgen. nov.

Shell solid, ovate-conical, imperforate, longitudinally ribbed and transversely liræ, covered with a thin epidermis. Aperture ovate, entire, indistinctly effuse at the base. Last whorl sometimes slightly prolonged inferiorly. Peristome thick, margins joined by a callosity. Operculum like that of *Tiphobia*.

PARAMELANIA DAMONI.

Shell solid, imperforate, ovate turreted, white, covered with an olive-brown epidermis, prettily sculptured with fine yet distinct wavy lines of increment, and more or less distinct transverse impressed striæ. Whorls 10, very concave at the upper part, the concavity

Fig. 1.



*Paramelania damoni*.

occupying about one third of the whorl; concavity smooth, merely exhibiting the epidermal sculpture; rest of the whorls coarsely plicated and spirally ridged. Plicæ rather acute, about 12 in number on the penultimate whorl, a little oblique on the last, and becoming obsolete about the middle. Spiral liræ rather slender, equal, continuous on and between the plicæ; 4 upon the upper volutions, and about 14 on the last. The uppermost, which defines the upper end of the costæ, is produced into very short hollow scales or spines upon the ribs; and the second and sometimes the third have the same character in a less marked degree. Aperture obliquely ovate, occupying about half the length of the shell, covered with a slight callous deposit far within, not quite obscuring the external

coloration. Outer lip somewhat expanded, much thickened within, white, concave above, arcuate at the side. Base also thickened and, together with the lower extremity of the whorl, forming a broad, retroverted, and very short cauda. Upper end of labrum joined to the base by a rather thick defined callosity, which spreads over the body-whorl within the mouth.

Length 35 millim., diam. above the aperture 16; aperture 15 long, 9 broad.

Operculum black, closing the aperture, but at some distance from the peristome.

#### PARAMELANIA CRASSIGRANULATA.

Shell solid (? fossil), imperforate, ovate turreted, dirty whitish (? bleached). Whorls probably about 8; four remaining narrowly excavated at the upper part, convexish at the sides, strongly plicate and spirally sulcated and ridged. Plicæ arcuate, oblique, 12 to 15 on the penultimate whorl, 15 to 17 on the last, becoming more or less obsolete towards the base. Sulci deep, cutting the plicæ into nodules, which number 5 or 6 upon the upper whorls. Transverse ridges on the last further apart below than above the middle, with the exception of 3 or 4 at the extreme base; these are finer, closer together, and hardly if at all granulous. Aperture, peristome, and basal prolongation very similar to those of the preceding species.

Length 28 millim., diam. 13; aperture 13 long, 7 wide.

Fig. 2.



*Paramelania crassigranulata.*

This species, of which we know but two specimens in worn and semifossil condition, is distinguished from the preceding by the narrower excavation or tabulation at the upper part of the volutions, and the more rounded and more coarsely granulated ribs and spiral liræ. The general form and the relative proportion of the spire to the length of the last whorl are so much alike in the two forms, that I feel a little hesitation in specifically separating them, bearing in mind the excessive variability of *P. nassa*.

## PARAMELANIA NASSA (Woodward.)

In my previous paper (P. Z. S. 1881, p. 292) I have remarked upon three forms of this species—the typical as described by Woodward, the larger variety sent by Dr. Kirk, and a small few-ribbed one collected by Mr. Thompson. A further investigation of these, based on the specimens kindly sent me by Mr. Damon, makes it somewhat doubtful whether, instead of the one species, they should not be rather regarded as three. At all events they are so readily distinguishable that I propose to give varietal names to them respectively, namely var. *grandis* (P. Z. S. 1881, pl. xxiv. figs. 26, 26a) and var. *paucicostata* (fig. 26b). The former not only exceeds the typical form in size, but the columella appears to be always slightly subtruncate at the base. The latter is a shorter shell, with a smaller and more acute spire; and the plicæ are considerably fewer than usual.

6. List of Birds recently collected by Dr. Kirk in Eastern Africa. By Captain G. E. SHELLEY, F.Z.S.

[Received March 23, 1881.]

(Plate LII.)

Dr. Kirk has kindly forwarded to me no less than seven collections of birds from the little-explored regions of Eastern Africa, from the following localities:—

A collection from Lamo, in 2° S. lat.

A collection from Melinda, in 3° S. lat.

Three collections from the Usambara country, from the valley of the Pangani river, labelled respectively "Pangani," "Usambara hills," "Usambara mountains."

A collection from Ugogo, about 200 miles due west from Zanzibar.

A collection from Dar-es-Salaam.

In the following paper, which gives an account of these collections, I shall follow the classification employed by Drs. Finsch and Hartlaub in their standard work 'Die Vögel Ostafrikas.' I have added a few notes to indicate the geographical distribution of each species in the Ethiopian region.

1. GYPOHIERAX ANGOLENSIS.

*Gypohierax angolensis* (Gm.), Finsch & Hartl. Vög. Ostaf. p. 77; Sharpe, Cat. B. i. p. 312.

Usambara hills.

Hitherto this species has only been recorded as East-African from the island of Pemba, in the same latitude. It also ranges throughout the entire West-African region, from Senegal to Angola.

2. SPIZAËTUS BELlicosus.

*Spizaëtus bellicosus* (Daud.), Finsch & Hartl. Vög. Ostaf. p. 47; Sharpe, Cat. B. i. p. 265.

Usambara mountains.

Rare in Eastern Africa, where it has previously only been recorded from the island of Zanzibar. Its range appears to be East Africa southward from the Usambara country, and South Africa, where it becomes rarer in the western districts.

### 3. *LOPHOAETUS OCCIPITALIS*.

*Spizaetus occipitalis* (Daud.), Finsch & Hartl. Vög. Ostaf. p. 50; Fischer & Reichenow, J. f. O. 1878, p. 251; Fischer, J. f. O. 1879, pp. 276, 292.

*Lophoaetus occipitalis*, Sharpe, Cat. B. i. p. 274.

Usambara hills.

Dr. Fischer found it abundant from Melinda, round Formosa Bay, to Witu. It inhabits the whole of Africa south of about 17° N. lat.

### 4. *CIRCAETUS CINEREUS*.

*Circaetus cinereus* (Vieill.), Finsch & Hartl. Vög. Ostaf. p. 54; Sharpe, Cat. B. i. p. 282.

Usambara mountains.

It inhabits the whole of Africa south of about 16° N. lat.

### 5. *BUTASTUR RUFIPENNIS*.

*Buteo rufipennis*, Strickl. P. Z. S. 1850, p. 214, pl. 22.

*Poliornis rufipennis*, Sundev., Heugl. Orn. N.O.-Afr. p. 95.

*Butastur rufipennis*, Sharpe, Cat. B. i. p. 299.

Pangani.

This is the most southern limit whence the species has been recorded. It ranges northward to Kordofan.

### 6. *FALCO CUVIERI*.

*Falco cuvieri*, Smith, Sharpe, Cat. B. i. p. 400.

Lamo.

New to East Africa. This rare species was formerly only known from South and West Africa.

### 7. *BAZA VERREAUXI*.

*Baza verreauxi* (Lafr.), Sharpe, Cat. B. i. p. 354.

*Avicida orientalis*, Fischer, J. f. O. 1879, p. 292.

*Avicida verreauxi*, Fischer & Reichenow, tom. cit. p. 339.

I recently procured a specimen of this rare Cuckoo-Falcon from a small collection made by the Rev. Thomas Wakefield at Rabbai, near Mombas. Dr. Fischer collected it at Muniuni. It ranges along the bushy coast-land of East Africa, as far south as Natal.

### 8. *ASTURINULA MONOGRAMMICA*.

*Asturinuia monogrammica* (Temm.), Finsch & Hartl. Vög. Ost-Afr. p. 59; Sharpe, P. Z. S. 1873, p. 711; id. Cat. B. i. p. 275; Nicholson, P. Z. S. 1878, p. 354; Cab. J. f. O. 1878, p. 242; Fischer

& Reichenow, tom. cit. pp. 251, 272; Fischer, J. f. O. 1879, p. 292; Gurney, Ibis, 1881, p. 124.

*Asturinula meridionalis* (Hartl.), Sharpe, Cat. B. i. p. 277.

Pangani river; Dar-es-Salaam.

This appears to be the commonest Hawk in Eastern Africa. It ranges on the east coast from Abyssinia to the Zambesi, and on the west coast from Senegal to Damaraland.

I agree with Mr. Nicholson (*l. c.*) in not considering *A. meridionalis* (Hartl.) to be distinct; or I should refer the specimens before me to that race.

#### 9. ASTUR POLYZONOIDES.

*Nisus badius* (part.), Finsch & Hartl. Vög. Ostaf. p. 81.

*Astur polyzonoides* (Smith), Sharpe, Cat. B. i. p. 113.

Dar-es-Salaam. One immature specimen.

This species has hitherto only been recorded from South Africa, where it is chiefly confined to the northern portion, from the Zambesi to Benguela.

#### 10. CIRCUS ÆRUGINOSUS.

*Circus æruginosus* (Linn.), Sharpe, Cat. B. i. p. 67.

Usambara hills. A fine adult male.

This is the first time the Marsh Harrier has been collected in East Africa. It ranges throughout the whole of the African continent, having been recorded from Natal and Angola; but is of rare occurrence south of the equator.

#### 11. GLAUCIDIUM PERLATUM.

*Glaucidium perlatum* (Vieill.), Sharpe, Cat. B. ii. p. 209.

Ugogo.

Mr. Sharpe (*l. c.*) gives as the range of this species "the whole of Africa south of the Sahara, excepting the forest-regions of the west and east coast."

This species is here recorded for the first time from East Africa north of the Zambesi. Ugogo is inland of the forest-region of the Zanzibar coast.

#### 12. GLAUCIDIUM CAPENSE.

*Athene capensis*, Smith, Finsch & Hartl. Vög. Ostaf. p. 98.

*Glaucidium capense*, Sharpe, Cat. B. ii. p. 223; Nicholson, P. Z. S. 1878, p. 354.

Dar-es-Salaam.

It ranges apparently throughout South Africa, and extends northward on the east coast to Dar-es-Salaam.

#### 13. BUBO MACULOSUS.

*Bubo maculosus* (Vieill.), Finsch & Hartl. Vög. Ostaf. p. 103; Sharpe, Cat. B. ii. p. 30.

Lamo; Usambara hills.

New to the Zanzibar district. Compared with Natal examples, these specimens agree perfectly; and I think Drs. Finsch and Hartlaub's reference (*l. c.*) should properly be referred to the present species, although Mr. Sharpe (*l. c.*) includes it as a synonym of *B. cinerascens*, Guér. I cannot now venture to offer an opinion upon the specific value of *B. cinerascens*, and can therefore only assign as the range of *B. maculosus* the whole of South Africa and East Africa as far north as Lamo.

#### 14. SCOPS CAPENSIS.

*Scops capensis* (Smith), Cab. J. f. O. 1878, p. 241.

Dar-es-Salaam.

This species was first collected in East Africa at Kitui, in Ukamba, by Dr. Hildebrandt, whence it ranges throughout Africa south of the equator, and in Western Africa extends as far north as the Gold Coast. North of these limits it is replaced by *S. giu*.

#### 15. SYRNIUM WOODFORDI.

*Syrnium woodfordi* (Smith), Finsch & Hartl. Vög. Ostaf. p. 108; Sharpe, Cat. B. ii. p. 267; Fischer & Reichenow, J. f. O. 1878, p. 251; Fischer, tom. cit. p. 273; id. J. f. O. 1879, pp. 289, 290; Fischer & Reichenow, tom. cit. p. 340; id. J. f. O. 1880, p. 140; Fischer, tom. cit. p. 188.

Pangani.

Dr. Fischer procured it at Witu, Muniuni, and Zanzibar. It ranges from Abyssinia throughout the whole of East and South Africa.

#### 16. CAPRIMULGUS MOSSAMBICUS.

*Caprimulgus mossambicus*, Peters, J. f. O. 1868, p. 134; Sharpe, New ed. Layard's B. S. Afr. p. 88.

*Caprimulgus fossei*, Finsch & Hartl. Vög. Ostaf. p. 123, pl. i.; Fischer, J. f. O. 1877, pp. 208, 423; Cab. J. f. O. 1878, p. 236; Fischer & Reichenow, tom. cit. p. 256; Fischer, J. f. O. 1879, p. 300; Fischer & Reichenow, tom. cit. p. 344.

Lamo; Melinda; Pangani; Usambara hills; Usambara mountains; Ugogo; Dar-es-Salaam.

This is apparently a common bird in the Zanzibar province. It is, I believe, confined to East Africa, where it ranges as far south as Tete, on the Zambesi.

#### 17. COSMETORNIS VEXILLARIUS.

*Cosmetornis vexillaris* (Gould), Finsch & Hartl. Vög. Ostaf. p. 129.

Ugogo.

This species ranges from the Upper White Nile district throughout East Africa to the Zambesi; is found in Madagascar and in South-west Africa, extending from Damaraland to Malemba, near the mouth of the Congo.



18. *HIRUNDO RUSTICA*.

*Hirundo ruistica* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 134 ; Sharpe, P. Z. S. 1870, p. 305 ; Sharpe & Dresser, tom. cit. p. 244 ; Fischer, J. f. O. 1877, p. 180 ; Cab. J. f. O. 1878, p. 222 ; Fischer, J. f. O. 1879, pp. 292, 293 ; Fischer & Reichenow, tom. cit. p. 344.

*Cecropis rustica*, Cab. J. f. O. 1878, p. 208.

Lamo ; Pangani river ; Ugo.

It ranges throughout Africa as a migrant, following the summer season.

19. *HIRUNDO MONTEIRI*.

*Hirundo montei*, Hartl., Finsch & Hartl. Vög. Ostaf. p. 139 ; Sharpe, P. Z. S. 1870, p. 316 ; 1873, p. 713 ; Cab. J. f. O. 1878, p. 222 ; Fischer & Reichenow, tom. cit. p. 257 ; Fischer, tom. cit. p. 280 ; id. J. f. O. 1879, p. 279 ; Fischer & Reichenow, tom. cit. p. 344.

Pangani ; Usambara hills.

It ranges in East Africa from Mombas to the Zambesi, and on the west coast from Damaraland to the Congo.

20. *HIRUNDO PUELLA*, Temm.

*Hirundo puella*, Finsch & Hartl. Vög. Ostaf. p. 140 ; Sharpe, P. Z. S. 1870, p. 319 ; 1873, p. 713 ; Cab. J. f. O. 1878, p. 222 ; Fischer & Reichenow, tom. cit. p. 257 ; Fischer, tom. cit. p. 280 ; id. J. f. O. 1879, p. 302 ; Fischer & Reichenow, tom. cit. p. 344.

Malinda ; Usambara hills ; Dar-es-Salaam.

This is a migratory species, common, according to Dr. Cabanis (*l. c.*), about Mombas from April to December, and breeding there. It ranges throughout East Africa from Abyssinia to Natal, where I have received several specimens from the neighbourhood of Durban. On the west coast it has been collected on the Cunene river in Benguela, and extends northward to Fantee, where I found it very abundant in February and March.

21. *EURYSTOMUS AFER*.

*Eurystomus afer* (Lath.), Finsch & Hartl. Vög. Ostaf. p. 150 ; Sharpe, Ibis, 1871, p. 274 ; id. P. Z. S. 1873, p. 712 ; Nicholson, P. Z. S. 1878, p. 354 ; Cab. J. f. O. 1878, p. 234 ; Fischer & Reichenow, tom. cit. p. 255 ; Fischer, tom. cit. p. 287 ; id. J. f. O. 1879, p. 291 ; Fischer & Reichenow, tom. cit. p. 243 ; Gurney, Ibis, 1881, p. 124.

Usambara mountains ; Dar-es-Salaam.

This species ranges throughout the whole of East Africa, from Kordofan to the Zambesi, and on the west coast from Senegal to Angola. I have examined a specimen collected by Mr. Oates, probably from the Matabili country ; but the exact locality was not recorded upon the label.

22. *CORACIAS GARRULA*.

*Coracias garrula*, Linn., Finsch & Hartl. Vög. Ostaf. p. 152; Sharpe, Ibis, 1871, p. 189; id. P. Z. S. 1873, p. 712; Cab. J. f. O. 1878, p. 234; Fischer, J. f. O. 1879, pp. 291, 303; Fischer & Reichenow, tom. cit. p. 343; Gurney, Ibis, 1881, p. 124.

Usambara mountains.

This species ranges throughout the entire African region, but migrates northward of the tropics about May.

23. *CORACIAS CAUDATA*.

*Coracias caudata*, Linn., Finsch & Hartl. Vög. Ostaf. p. 154; Sharpe, Ibis, 1871, p. 194; id. P. Z. S. 1873, p. 712; Fischer, J. f. O. 1877, p. 178; Nicholson, P. Z. S. 1878, p. 354; Cab. J. f. O. 1878, p. 234; Fischer & Reichenow, tom. cit. p. 254; Fischer, J. f. O. 1879, pp. 283, 291; Gurney, Ibis, 1881, p. 124.

Pangani; Usambara mountains; Dar-es-Salaam.

This is a common bird, and very generally distributed throughout East Africa, extending as far north as Bogue, near the southern extremity of the Victoria Nyanza, where it has been collected by Captain Speke. It also ranges over the whole of South Africa and Angola.

24. *CORACIAS NÆVIA*.

*Coracias nœvia*, Daud., Sharpe, Ibis, 1871, p. 190.

Dar-es-Salaam.

This species ranges throughout Africa south of about 17° N. lat., but is here recorded for the first time from East Africa.

25. *HAPALODERMA CONSTANTIA*.

*Trogon narina* (part.), Finsch & Hartl. Vög. Ostaf. p. 155; Fischer & Reichenow, J. f. O. 1878, p. 253; Fischer, J. f. O. 1879, pp. 288, 289; Fischer & Reichenow, tom. cit. p. 342; Gurney, Ibis, 1881, p. 124.

*Hapaloderma constantia*, Sharpe & Ussher, Ibis, 1872, p. 281.

Melinda; Usambara mountains.

These two specimens agree perfectly with one of the types of *H. constantia* in my own collection.

This race, as yet only recorded from Fantec and the Zanzibar coast, is, I suspect, the one which inhabits North-eastern Africa, *H. narina* (Vieill.) being probably confined to South Africa. Jointly these races inhabit the whole of Africa south of the equator, and extend northward to Ailet on the Red Sea and to Fantec on the west coast.

26. *HALCYON SENEGALOIDES*.

*Halcyon senegaloides*, Smith, Sharpe, Monogr. Alced. p. 187, pl. 68; Cab. J. f. O. 1878, p. 235.

*Halcyon irroratus*, Reichenb., Finsch & Hartl. Vög. Ostaf. p. 159; Fischer & Reichenow, J. f. O. 1878, p. 258; Fischer, tom.

cit. p. 288; id. J. f. O. 1879, p. 293; Fischer & Reichenow, tom. cit. p. 343.

Lamo; Melinda; Pangani.

This species ranges from Lamo to Port Natal.

#### 27. HALCYON SEMICÆRULEA.

*Halcyon semicærulea* (Forsk.), Sharpe, Monogr. Alced. p. 173, pl. 64; Finsch & Hartl. Vög. Ostaf. p. 160; Sharpe, P. Z. S. 1873, p. 712; Fischer, J. f. O. 1877, pp. 172, 180; Cab. J. f. O. 1878, p. 235; Fischer & Reichenow, tom. cit. p. 255; Fischer, J. f. O. 1879, pp. 293, 303.

Pangani.

In East Africa this Kingfisher has not yet been recorded from any locality between Zanzibar and the Zambesi; but I have had the opportunity of examining a specimen collected by Mr. Oates from South-eastern Africa, between Tati and the Victoria falls of the Zambesi.

This species ranges from 16° N. lat. to about 21° S. lat.; but is only met with as a straggler towards its southern limits.

#### 28. HALCYON ORIENTALIS.

*Halcyon orientalis*, Peters, Sharpe, Monogr. Alced. p. 181, pl. 66; Finsch & Hartl. Vög. Ostaf. p. 162; Fischer & Reichenow, J. f. O. 1878, p. 255; Fischer, tom. cit. p. 288; id. J. f. O. 1879, p. 293; Gurney, Ibis, 1881, p. 124.

Lamo.

This species ranges throughout East Africa from Lamo to the Zambesi. Some specimens in my own collection from the Zambesi approach so nearly in their plumage to the common *H. albiventris* of Natal that it is not without hesitation that I keep *H. orientalis* and *H. albiventris* as distinct species.

They appear to me to be local varieties which lose their characters towards the confines of their respective habitats, as, for instance, between the Zambesi and the Transvaal.

#### 29. HALCYON CHELICUTENSIS.

*Halcyon chelicutensis* (Stanley), Sharpe, Monogr. Alced. p. 182, pl. 67; Finsch & Hartl. Vög. Ostaf. p. 163; Sharpe, P. Z. S. 1873, p. 712; Fischer, J. f. O. 1877, pp. 171, 172, 176; Nicholson, P. Z. S. 1878, p. 354; Fischer & Reichenow, J. f. O. 1878, p. 255; Fischer, tom. cit. p. 288; id. J. f. O. 1879, pp. 293, 303; Fischer & Reichenow, tom. cit. p. 344; Gurney, Ibis, 1881, p. 124.

*Halcyon variegatus*, Cab. J. f. O. 1878, p. 235.

Melinda; Pangani; Usambara mountains.

It ranges from about 16° N. lat. to 30° S. lat.

#### 30. CORYTHORNIS CYANOSTIGMA.

*Corythornis cristatus*, Sharpe, Monogr. Alced. p. 35, pl. 11 (1869).  
*Alcedo cristata*, Finsch & Hartl. Vög. Ostaf. p. 167; Fischer,

J. f. O. 1877, p. 207; Cab. J. f. O. 1878, p. 235; Fischer & Reichenow, tom. cit. p. 255; Fischer, tom. cit. p. 288; id. J. f. O. 1879, p. 293.

*Corythornis cyanostigma* (Rüpp.), Sharpe, Monogr. Alced. p. vi (1871).

Pangani; Usambara hills.

This species is not uncommon from Mombas to Zanzibar, and is probably evenly distributed throughout East Africa. It ranges over the entire African continent south of about 15° N. lat.

It appears to me strange that the correct name for this species should be so generally overlooked by recent writers.

### 31. ISPIDINA PICTA.

*Ispidina picta* (Bodd.), Sharpe, Monogr. Alced. p. 141, pl. 51.

*Alcedo picta*, Finsch & Hartl. Vög. Ostaf. p. 171; Cab. J. f. O. 1878, p. 235; Fischer & Reichenow, tom. cit. p. 256; Fischer, tom. cit. p. 288.

Dar-es-Salaam.

From Dar-es-Salaam, its southern limit on the east coast, it ranges northward into Abyssinia, and extends over the entire west coast from Senegal to the Quanza river in Angola.

### 32. CERYLE RUDIS.

*Ceryle rudis* (Linn.), Sharpe, Monogr. Alced. p. 61, pl. 19; Finsch & Hartl. Vög. Ostaf. p. 175; Fischer, J. f. O. 1877, p. 425; Nicholson, P. Z. S. 1878, p. 355; Cab. J. f. O. 1878, p. 235; Fischer & Reichenow, tom. cit. p. 255; Fischer, tom. cit. p. 289; id. J. f. O. 1879, p. 293.

Pangani river; Dar-es-Salaam.

This species ranges throughout the entire African continent.

### 33. MEROPS APIASTER.

*Merops apiaster*, Linn., Heugl. Orn. N.O.-Afr. p. 195.

Dar-es-Salaam.

The Common Bee-eater is here recorded for the first time from East Africa. It ranges over the whole of Africa, but everywhere occurs only on migration.

### 34. MEROPS SUPERCILIOSUS.

*Merops superciliosus*, Linn., Finsch & Hartl. Vög. Ostaf. p. 178; Fischer, J. f. O. 1877, p. 177; Nicholson, P. Z. S. 1878, p. 355; Cab. J. f. O. 1878, p. 235; Fischer & Reichenow, tom. cit. p. 256; Gurney, Ibis, 1881, p. 125.

Pangani; Melinda; Dar-es-Salaam.

This species is undoubtedly distinct from *M. ægyptius*, Forsk., which latter bird has often been referred to as the adult summer plumage of the present species; and, owing to this error, I cannot venture to define accurately their geographical distribution. The present species certainly ranges throughout the whole of East and

South Africa, Madagascar, and the Comoro Islands; while *M. ægyptius* as certainly ranges throughout North Africa, and extends southward to Durban, in Natal; but it appears to be by far the rarest of the two species south of the equator.

### 35. *MEROPS NUBICUS*.

*Merops nubicus*, Gm., Finsch & Hartl. Vög. Ostaf. p. 182; Fischer & Reichenow, J. f. O. 1878, p. 256; Fischer, tom. cit. p. 288; Bocage, Orn. d'Angola, p. 90; Fischer, J. f. O. 1879, pp. 282, 294, 302, 303.

Lamo; Pangani.

The Pangani river appears to be its furthest authentic limit south, as its occurrence in Cape Colony, on the authority of a specimen in the Leiden Museum, is very doubtful; nor do I consider its claims to be a native of Angola any more satisfactory. I am, in consequence, obliged to limit the range of this species in East Africa from 15° N. lat. to Zanzibar, and in West Africa to Senegambia.

### 36. *MELITTOPHAGUS PUSILLUS*.

*Merops minutus* (P. L. S. Müll.), Finsch & Hartl. Vög. Ostaf. p. 188; Fischer & Reichenow, J. f. O. 1878, p. 256; Fischer, tom. cit. p. 288.

*Merops pusillus*, Sharpe, P. Z. S. 1873, p. 712; Nicholson, P. Z. S. 1878, p. 355.

*Melittophagus cyanostictus*, Cab. J. f. O. 1875, p. 340; id. J. f. O. 1878, p. 235.

Lamo; Melinda; Dar-es-Salaam.

This species ranges throughout Africa south of about 17° N. lat., and is represented in my collection by three races, to be distinguished by the following characters:—(1) East-African race, *M. cyanostictus*, Cab., with a distinct cobalt-blue eyebrow extending forward in a narrow streak round the forehead, the front border of the black collar rather more distinctly margined with blue than in the next two races, represented by five East-African specimens; (2) South-African race, with a distinct blue eyebrow of a paler shade than in the last race and not extending forward to the forehead, represented by nine South-African and two Congo specimens; (3) Gold Coast race, the blue eyebrow barely visible and not extending forward beyond the eye, the blue front border to the black collar generally a trifle narrower than in the other races, represented by seven specimens from the Gold Coast.

I can detect no other characters for these races, and do not consider those mentioned to be of specific value.

### 37. *DICROCERCUS HIRUNDINACEUS*.

*Merops hirundineus* (Licht.), Finsch & Hartl. Vög. Ostaf. p. 193.

*Dicrocercus hirundinaceus*, Nicholson, P. Z. S. 1878, p. 355.

Dar-es-Salaam.

This species ranges in East Africa from the Djur country (Upper

White Nile district) to the Zambesi, and on the west coast from Senegal to the Orange river in South Africa.

### 38. UPUPA AFRICANA.

*Upupa africana*, Bechst., Finsch & Hartl. Vög. Ostaf. p. 200.

*Upupa minor*, Cab. J. f. O. 1878, p. 234.

Pangani.

Dr. Cabanis, *l. c.*, records it as having been collected by Dr. Hildebrandt in Uteita, its most northerly habitat in East Africa yet known. It also inhabits the whole of South and West Africa.

### 39. IRRISOR ERYTHORHYNCHUS.

*Irrisor erythrorhynchus* (Lath.), Finsch & Hartl. Vög. Ostaf. p. 202; Sharpe, P. Z. S. 1873, p. 712; Fischer, J. f. O. 1877, p. 178; Nicholson, P. Z. S. 1878, p. 355; Fischer & Reichenow, J. f. O. 1878, p. 256; Fischer, tom. cit. p. 287; id. J. f. O. 1879, p. 291; Fischer & Reichenow, J. f. O. 1880, p. 141; Gurney, Ibis, 1881, p. 125.

*Irrisor senegalensis*, Cab. J. f. O. 1878, p. 234.

Usambara mountains; Ugogo; Dar-es-Salaam.

It ranges throughout Africa south of about 16° N. lat.

### 40. RHINOPOMASTES CYANOMELAS.

*Irrisor cyanomelas* (Vieill.), Finsch & Hartl. Vög. Ostaf. p. 207; Fischer & Reichenow, J. f. O. 1878, p. 256; Fischer, tom. cit. p. 287; id. J. f. O. 1879, p. 291; Fischer & Reichenow, tom. cit. p. 344.

*Rhinopomastes cyanomelas*, Cab. J. f. O. 1878, p. 235.

Lamo.

This species ranges throughout Africa south of about 15° N. lat.

### 41. CINNYRIS MICRORHYNCHUS.

*Nectarinia jardinei*, Finsch & Hartl. Vög. Ostaf. p. 218, pl. 2. fig. 1; Sharpe, P. Z. S. 1873, p. 713; Fischer & Reichenow, J. f. O. 1878, p. 260; Fischer, tom. cit. p. 280; Fischer, J. f. O. 1880, pp. 188, 191.

*Cinnyris microrhynchus*, Shelley, Monogr. Sun-birds, p. 219, pl. 67 (1876); Nicholson, P. Z. S. 1878, p. 355; Gurney, Ibis, 1881, p. 125.

*Cinnyris jardinei*, Cab. J. f. O. 1878, p. 227; Fischer & Reichenow, J. f. O. 1879, p. 347.

Usambara hills; Dar-es-Salaam.

This species is confined to the Zanzibar coast.

### 42. CINNYRIS GUTTURALIS.

*Nectarinia gutturalis* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 216; Sharpe, P. Z. S. 1873, p. 713; Fischer & Reichenow, J. f. O. 1878, p. 260; Fischer, tom. cit. p. 280; id. J. f. O. 1879, p. 300; id. J. f. O. 1880, pp. 188, 191.

*Cinnyris gutturalis*, Shelley, Monogr. Sun-birds, p. 261, pl. 81;

Nicholson, P. Z. S. 1878, p. 355; Cab. J. f. O. 1878, p. 227; Fischer & Reichenow, J. f. O. 1879, p. 348; Gurney, Ibis, 1881, p. 125.

Pangani; Usambara hills; Dar-es-Salaam.

This species ranges from Mombas to Natal, and thence to Damaraland and Angola.

#### 43. CINNYRIS KIRKI.

*Cinnyris kirki*, Shelley, Monogr. Sun-birds, p. 273, pl. 85 (1876); Gurney, Ibis, 1881, p. 125.

*Cinnyris kalcikreuthi*, Cab. J. f. O. 1878, p. 227; Fischer & Reichenow, J. f. O. 1879, p. 348.

*Nectarinia kalcikreuthi*, Fischer & Reichenow, J. f. O. 1878, p. 260; Fischer, tom. cit. p. 280; id. J. f. O. 1879, p. 300.

Usambara hills.

This species is confined to East Africa, where it ranges from Mombas to the Zambesi.

#### 44. ANTHREPTES ZAMBESIANA.

*Nectarinia collaris*, pt., Finsch & Hartl. Vög. Ostaf. p. 223; Sharpe, P. Z. S. 1873, p. 713; Fischer & Reichenow, J. f. O. 1878, p. 260; Fischer, J. f. O. 1879, p. 300, 1880, pp. 188, 191.

*Anthodiæta zambesiana*, Shelley, Monogr. Sun-birds, p. 343, pl. 111; Nicholson, P. Z. S. 1878, p. 356; Gurney, Ibis, 1881, p. 125.

*Anthodiæta collaris*, Cab. J. f. O. 1878, p. 227.

Pangani; Dar-es-Salaam.

Like the last species, it ranges from Mombas to the Zambesi.

#### 45. CISTICOLA ISODACTYLA.

*Drymoica isodactyla*, Finsch & Hartl. Vög. Ostaf. p. 236; Sharpe, P. Z. S. 1873, p. 712.

*Cisticola isodactyla*, Peters, Nicholson, P. Z. S. 1878, p. 356.

Pangani; Usambara hills; Dar-es-Salaam.

This is a common bird on the Zanzibar coast, and ranges from Mombas to Delagoa Bay in South-eastern Africa.

#### 46. CISTICOLA HÆMATOCEPHALA.

*Drymoica stulta*, Finsch & Hartl. Vög. Ostaf. p. 235.

*Cisticola hæmatocephala*, Cab. J. f. O. 1878, p. 222; Fischer & Reichenow, tom. cit. p. 267; Fischer, tom. cit. p. 280; id. J. f. O. 1879, pp. 279, 303; Fischer & Reichenow, tom. cit. p. 354.

Lamo.

This species has been collected at Mombas by the Baron von der Decken and by Dr. Fischer; and the latter gentleman gives a description of the nest and eggs. Dr. Hildebrandt procured it on the coast and at Kitui in Ukamba. Beyond this limited portion of Eastern Africa it has, as yet, only been recorded from the Loango coast, in Western Africa, by Dr. Cabanis.

47. *CISTICOLA RHODOPTERA*.

*Cisticola rhodoptera*, Shelley, Ibis, 1880, p. 333.

Usambara hills.

The type specimen is the only one I have yet seen of this species.

48. *MELOCICHLA MENTALIS*.

*Drymoica mentalis*, Fraser, P. Z. S. 1843, p. 16.

*Melocichla mentalis*, Cab. J. f. O. 1878, p. 221.

Usambara mountains.

Dr. Hildebrandt collected this bird at Kitui in Ukamba. The only other locality I am aware of for this species is the Gold Coast. Two specimens collected by Dr. Kirk agree well with skins in my own collection from Fantee.

49. *SAXICOLA CENANTHE*.

*Saxicola ananthe*, Linn., Cab. J. f. O. 1878, p. 220; Gurney, Ibis, 1881, p. 125.

Usambara hills; Usambara mountains.

The Common Wheatear was first collected in East Africa by Dr. Hildebrandt, near the Adi river in Ukamba.

This species ranges throughout North Africa, and extends southward on the east coast to the Pangani river, and on the west coast to the Gambia.

50. *SAXICOLA SHELLEYI*.

*Saxicola shelleyi*, Sharpe, new ed. Layard's B. S. Afr. p. 246.

Ugogo.

Dr. Kirk has sent me three specimens (*a*, *b*, *c*), which differ considerably in their plumage, although all collected at the same time of the year.

As this species is but little known, I shall give a short description of the plumage of these specimens, as well as of two others (*d*, *e*) from the Zambesi, collected by Dr. Bradshaw and also in my own collection.

In all the general plumage is black.

Spec. *a* has the forehead and crown white slightly shaded with brown, and with indistinct brown stripes down the centres of the feathers; the wing-coverts, with the exception of a few of the outer ones, are white; the primary- and greater wing-coverts broadly tipped with black; the basal half of the outer scapulars edged with white.

Spec. *b*. Forehead, crown, and chin slightly mottled with white feathers; wings as in spec. *a*, only with the black tips to the primary- and greater wing-coverts slightly broader.

Spec. *c*. Entire chin and throat white, the feathers narrowly tipped with black, forming irregular bars; the centre of the chest mottled with white; wings as in spec. *a*, excepting that the black ends to the greater wing-coverts gradually disappear towards the innermost ones, which are entirely white.

Spec. *d*. Similar in plumage to spec. *c*, but with the white feathers



not descending so far down on the centre of the chest ; no black ends to any of the wing-coverts ; primary-coverts more narrowly tipped with black.

Spec. *e*. Similar to spec. *d*, with the white feathers of the throat ending at the base of the crop ; only the basal half of the primary-coverts white, the greater coverts broadly tipped with black.

#### 51. MOTACILLA VIDUA.

*Motacilla vidua*, Sund., Finsch & Hartl. Vög. Ostaf. p. 263 ; Fischer J. f. O. 1879, p. 294 ; Fischer & Reichenow, tom. cit. p. 355.

Ugogo.

This species was first collected in the Zanzibar province by Dr. Fischer, at Muniuni. It ranges from the First Cataract of the Nile throughout East and South Africa, and thence on the west coast as far north as Lagos.

#### 52. MOTACILLA FLAVA.

*Motacilla flava*, Linn., Finsch & Hartl. Vög. Ostaf. p. 268 ; Fischer & Reichenow J. f. O. 1878, p. 268 ; Fischer, J. f. O. 1879, pp. 294, 303.

Pangani.

This species ranges over the whole of Africa.

#### 53. ANTHUS RAALTENI.

*Anthus raalteni*, Temm., Finsch & Hartl. Vög. Ostaf. p. 274 ; Fischer, J. f. O. 1877, p. 207 ; Nicholson, P. Z. S. 1878, p. 356 ; Cab. J. f. O. 1878, p. 220 ; Fischer & Reichenow, tom. cit. p. 268 ; Fischer, tom. cit. p. 279 ; id. J. f. O. 1879, pp. 294, 297, 299, 303 ; Fischer & Reichenow, tom. cit. p. 355.

Pangani.

#### 54. ANTHUS PYRRHONOTUS, Vieill.

Melinda.

New to East Africa.

This species ranges throughout South Africa, and extends northward on the east coast to Melinda.

#### 55. MACRONYX CROCEUS.

*Macronyx croceus* (Vieill.), Finsch & Hartl. Vög. Ostaf. p. 276 ; Cab. J. f. O. 1878, p. 220 ; Fischer & Reichenow, tom. cit. p. 267 ; Fischer, tom. cit. p. 279 ; id. J. f. O. 1879, pp. 294, 303 ; Fischer & Reichenow, tom. cit. p. 355 ; Gurney, Ibis, 1881, p. 125.

*Macronyx striolatus*, Nicholson, P. Z. S. 1878, p. 356.

Usambara hills ; Dar-es-Salaam.

On the east coast it ranges from the White-Nile district to Natal, and on the west coast from Senegal to Angola. The exact distribution in South Africa appears to me to be as yet a little uncertain ; for, although common in the eastern districts in suitable localities,

I am not aware of its having been collected either in Cape Colony or in Damaraland.

I do not consider *M. striolatus*, Heugl., and *M. croceus* (Vieill.) to be distinct.

56. *MACRONYX TENELLUS*.

*Macronyx tenellus*, Cab. J. f. O. 1878, pp. 205, 220, pl. 2. fig. 1 ; Fischer, J. f. O. 1879, p. 299 ; Fischer & Reichenow, tom. cit. p. 355.

Lama.

This species appears to have a very limited range, having only as yet been recorded from the northern portion of the Zanzibar province.

57. *TURDUS LIBONYANUS*.

*Turdus libonyanus*, Smith, Finsch & Hartl. Vög. Ostaf. p. 280 ; Fischer & Reichenow, J. f. O. 1880, p. 144.

Ugogo.

Dr. Fischer procured this species at Mozambique in May. It ranges southward from Ugogo to Kuruman and thence to Damaraland and Benguela, but is a rare and local bird, apparently not inhabiting Cape Colony nor yet recorded from any portion of West Africa.

58. *TURDUS TEPHRONOTUS*.

*Turdus tephronotus*, Cab. J. f. O. 1878, pp. 205, 218, pl. 3. fig. 2 ; Fischer & Reichenow, tom. cit. p. 268 ; Fischer, tom. cit. p. 279 ; id. J. f. O. 1879, p. 279.

Lamo.

This species was first described by Cabanis, *l. c.*, from specimens collected by Dr. Hildebrandt during his journey into Uteita and Ukambani, at the Tiva river and at Udi. Dr. Fischer procured it at Lamo and at Kipini ; and as yet these are the only localities where it is known to occur.

59. *COSSYPHA NATALENSIS*.

*Cossypha natalensis* (Smith), Finsch & Hartl. Vög. Ostaf. p. 282. *Bessornis natalensis*, Fischer, J. f. O. 1879, pp. 278, 287 ; Fischer & Reichenow, tom. cit. p. 356.

Lamo ; Melinda.

It ranges from Lamo to Natal, and crosses the northern portion of South Africa to Benguela and Angola.

60. *COSSYPHA HEUGLINI*.

*Cossypha heuglini*, Hartl., Finsch & Hartl. Vög. Ostaf. p. 283. *Bessornis heuglini*, Cab. J. f. O. 1878, p. 219 ; Fischer & Reichenow, tom. cit. p. 268 ; Fischer, J. f. O. 1879, pp. 278, 287, 303 ; Fischer & Reichenow, tom. cit. p. 356.

Lamo ; Ugogo.

The type was collected at Wau, in the White-Nile district,

whence it ranges southward, on the east coast, to Ugogo, and has been recorded from the west coast from the Congo and Benguela.

61. *MONTICOLA SAXATILIS*.

*Monticola saxatilis* (Linn.), Cab. J. f. O. 1878, p. 219; Gurney, Ibis, 1881, p. 125.

*Petrocincla saxatilis*, Fischer & Reichenow, J. f. O. 1879, p. 355; 1880, p. 144.

Pangani; Usambara hills; Usambara mountains; Ugogo.

Although apparently a common bird in the Zanzibar province, it had not been recorded from East Africa previous to its being collected by Dr. Hildebrandt at Duruma in Wanika and in Ukamba. It ranges throughout North Africa, extending southward in East Africa to Bagamoyo, opposite Zanzibar Island, where it has been collected by Dr. Fischer, and inland to Ugogo.

62. *CRATEROPUS KIRKI*.

*Crateropus jardinei*, Sclat. P. Z. S. 1864, p. 108; Finsch & Hartl. Vög. Ostafri. p. 289, pt.

*Crateropus kirki*, Sharpe, Nicholson, P. Z. S. 1878, p. 356; Cab. J. f. O. 1878, p. 226; Fischer & Reichenow, tom. cit. p. 260; Fischer, tom. cit. p. 278.

Usambara hills; Usambara mountains.

This species ranges from Bogue in Uzinga (where it has been recorded on the authority of Captain Speke) southward to the Zambesi.

63. *ARGYA RUBIGINOSA*.

*Crateropus rubiginosus*, Rüpp., Fischer & Reichenow, J. f. O. 1878, p. 260; Fischer, J. f. O. 1879, p. 289.

Pangani.

Dr. Fischer procured this species at Mombas. There is a specimen from Zanzibar in the British Museum. From Zanzibar it ranges northward to Shoa, in North-eastern Africa, about 10° N. lat.

64. *PHYLLOSTREPHUS STREPITANS*.

*Criniger strepitans*, Reichenow, Ornith. Centralbl. 1879, p. 139; Fischer, J. f. O. 1879, pp. 278, 287; Reichenow & Schalow, tom. cit. p. 318.

*Phyllostrephus sharpei*, Shelley Ibis, 1880, p. 334.

*Phyllostrephus strepitans*, Sharpe, Cat. B. vi. p. 117.

Dar-es-Salaam.

This species ranges from Melinda, where it has been collected by Dr. Fischer, to Dar-es-Salaam.

Mr. Sharpe, who has recently examined these birds in the course of preparing the British-Museum Catalogue, informs me that *Criniger strepitans* is identical with my *Phyllostrephus sharpei*.

65. *ORIOLOUS GALBULA*.

*Oriolus galbula*, Linn., Sharpe, P. Z. S. 1873, p. 714; id. Cat.

B. iii. p. 191; Cab. J. f. O. 1878, p. 234; Gurney, Ibis, 1881, p. 126.

Lamo; Usambara mountains; Ugogo.

It ranges throughout Africa, but is everywhere migratory, only occurring in Tropical and Southern Africa during the winter months.

#### 66. *ORIOIUS NOTATUS*.

*Oriolus notatus*, Peters, Finsch & Hartl. Vög. Ostaf. p. 291; Sharpe, Cat. B. iii. p. 196; Cab. J. f. O. 1878, p. 234; Fischer & Reichenow, tom. cit. p. 261; Fischer, tom. cit. p. 287; Fischer & Reichenow, J. f. O. 1879, p. 349; Gurney, Ibis, 1881, p. 126.

Lamo; Melinda; Usambara mountains; Ugogo.

In nine East- and South-African specimens before me the black on the tail differs in extent in each; and it appears to me that there are no constant characters by which *O. auratus*, Vieill., and *O. notatus*, Peters, can be specifically separated.

#### 67. *ORIOIUS BRACHYRRHYNCHUS*.

*Oriolus larvatus*, Sharpe, P. Z. S. 1873, p. 714; Nicholson, P. Z. S. 1878, p. 356.

*Oriolus brachyrrhynchus*, Swains., Sharpe, Cat. B. iii. p. 218.

*Oriolus rolleti*, Fischer & Reichenow, J. f. O. 1878, p. 262; Fischer, J. f. O. 1879, pp. 282, 300; Fischer & Reichenow, tom. cit. p. 349.

Lamo; Melinda; Usambara mountains; Dar-es-Salaam.

It ranges in Eastern Africa from Lamo to Dar-es-Salaam, and on the west coast from Sierra Leone to the Gaboon. I have one of Dr. Fischer's specimens from Mombas, labelled *O. rolleti*, which belongs to this species, not to the larger South-African form *O. larvatus*. The *O. larvatus* of both Sharpe and Nicholson (*ll. cc.*) undoubtedly belongs to this species.

#### 68. *ANDROPADUS FLAVESCENS*.

*Andropadus flavescens*, Hartl., Finsch & Hartl. Vög. Ostaf. p. 295, pl. 3. fig. 1; Sharpe, P. Z. S. 1873, p. 712; Fischer, J. f. O. 1877, pp. 180, 425; Fischer & Reichenow, J. f. O. 1878, p. 261; Fischer, tom. cit. p. 278; id. J. f. O. 1879, pp. 287, 303; Fischer & Reichenow, tom. cit. p. 348; Fischer, J. f. O. 1880, pp. 188, 192.

Lamo; Melinda; Pangani.

It ranges from Lamo to Zanzibar.

#### 69. *PYCNONOTUS LAYARDI*.

*Pycnonotus nigricans*, Finsch & Hartl. Vög. Ostaf. p. 297, part.; Sharpe, P. Z. S. 1873, p. 712; Fischer, J. f. O. 1877, p. 175; Cab. J. f. O. 1878, p. 227; Fischer & Reichenow, tom. cit. p. 260; Fischer, tom. cit. p. 278; id. J. f. O. 1879, pp. 287, 303; 1880, pp. 188, 192.

*Pycnonotus layardi*, Gurney, Ibis, 1879, p. 390.

Pangani; Usambara hills; Usambara mountains; Dar-es-Salaam.

None of Dr. Kirk's specimens has the red-wattled eyelid of *P. nigricans*; but all agree perfectly with the common Natal form, for which Mr. Gurney, *l. c.*, has proposed the name of *P. layardi*.

This species ranges from Mombas southward throughout Eastern Africa to Natal and Kaffraria.

70. *MUSCICAPA GRISOLA*.

*Muscicapa grisola*, Linn., Finsch & Hartl. Vög. Ostaf. p. 300; Sharpe, P. Z. S. 1873, p. 713; id. Cat. B. iv. 151; Fischer, J. f. O. 1877, p. 180; id. 1879, p. 302.

*Butalis grisola*, Cab. J. f. O. 1878, p. 223; Fischer & Reichenow, tom. cit. p. 258.

Pangani; Usambara hills; Usambara mountains.

It ranges throughout Africa, but is migratory in its habits.

71. *TERPSIPHONE PERSPICILLATA*.

*Terpsiphone cristata*, Finsch & Hartl. Vög. Ostaf. p. 304; Fischer, J. f. O. 1877, pp. 172, 175, 179, 207.

*Terpsiphone perspicillata*, Swains., Sharpe, Cat. B. iv. p. 357.

Usambara mountains.

This species ranges throughout South Africa to Angola on the west coast, and to the Usambara country in East Africa.

72. *TERPSIPHONE CRISTATA*.

*Terpsiphone melanogastra*, Finsch & Hartl. Vög. Ostaf. p. 309; Fischer, J. f. O. 1879, pp. 278, 288, 300, 303.

*Terpsiphone ferreti*, Cab. J. f. O. 1878, p. 223; Fischer & Reichenow, tom. cit. p. 258; Fischer, tom. cit. p. 273; id. J. f. O. 1879, p. 277; Fischer & Reichenow, tom. cit. p. 345.

*Terpsiphone cristata* (Gm.), Sharpe, Cat. B. iv. p. 354.

Lamo; Melinda.

This species ranges in East Africa from Kordofan to Zanzibar, in which latter locality it has been collected by Dr. Fischer, and on the west coast from Senegal to the Congo.

73. *BATIS SENEGALENSIS*.

*Platystira senegalensis* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 317; Fischer & Reichenow, J. f. O. 1878, p. 257; Fischer, tom. cit. p. 274; id. J. f. O. 1879, pp. 288, 303.

*Batis senegalensis*, Sharpe, Ibis, 1873, p. 173; id. P. Z. S. 1873, p. 713; id. Cat. B. iv. p. 134.

Usambara hills; Usambara mountains; Dar-es-Salaam.

This species ranges from 16° N. lat., on the east coast, to Dar-es-Salaam, and on the west coast from Senegal to the Congo.

The *Platystira senegalensis*, Monteiro (P. Z. S. 1865, p. 95), from Benguela, refers to *Batis pririt* (Vieill.).

74. *PLATYSTIRA PELTATA*.

*Platystira peltata*, Sundev., Sharpe, Ibis, 1873, p. 160, pl. 4. figs. 2, 3; Cab. J. f. O. 1878, p. 224; Fischer & Reichenow, tom.

cit. p. 257; Fischer, tom. cit. p. 274; Sharpe, Cat. B. iv. p. 147; Fischer, J. f. O. 1879, p. 288.

Lamo.

It ranges from Lamo to the Zambesi and the eastern portion of South Africa.

#### 75. BRADYORNIS PALLIDUS.

*Bradyornis pallidus* (Müll.), Finsch & Hartl. Vög. Ostaf. p. 322; Sharpe, Cat. B. iii. p. 310; Nicholson, P. Z. S. 1878, p. 357; Cab. J. f. O. 1878, p. 223; Fischer & Reichenow, tom. cit. p. 257; Fischer, tom. cit. p. 273; id. J. f. O. 1879, pp. 277, 299, 303; Fischer & Reichenow, tom. cit. p. 345.

*Bradyornis modestus*, Shelley, Ibis, 1873, p. 140; Sharpe, Cat. B. iii. p. 310.

*Bradyornis subalaris*, Sharpe, P. Z. S. 1873, p. 713, pl. 58. fig. 1.

Lamo; Dar-es-Salaam.

This species ranges from Kordofan to Dar-es-Salaam, and crosses the continent to the Gold Coast, where I collected a specimen which I incorrectly described as new under the title of *B. modestus*.

#### 76. PARUS ALBIVENTRIS.

*Parus albiventris*, Shelley, Ibis, 1881, p. 116.

Ugogo.

Only known by the two type specimens, probably male and female.

#### 77. BUCHANGA ASSIMILIS.

*Dicrurus divaricatus*, Finsch & Hartl. Vög. Ostaf. p. 323; Sharpe, P. Z. S. 1873, p. 714; Fischer, J. f. O. 1877, p. 172, 1880, p. 188.

*Buchanga assimilis* (Bechst.), Sharpe, Cat. B. iii. p. 247; Nicholson, P. Z. S. 1878, p. 357.

*Dicrurus fugax*, Cab. J. f. O. 1878, p. 227; Fischer & Reichenow, tom. cit. p. 258; Fischer, J. f. O. 1879, pp. 300, 303.

Lamo; Melinda; Pangani; Usambara hills; Dar-es-Salaam.

It inhabits the whole of Africa south of about 16° N. lat.

#### 78. DICRURUS ATRIPENNIS.

*Dicrurus atripennis*, Swains., Sharpe, Cat. B. iii. p. 232.

Usambara mountains.

This is the first mention of the species from East Africa. It ranges from the Usambara country to Fantee, and thence to the river Gambia.

#### 79. CAMPEPHAGA NIGRA.

*Campephaga nigra* (Vieill.), Cab. J. f. O. 1878, p. 227; Fischer & Reichenow, tom. cit. p. 258; Fischer, J. f. O. 1879, p. 278; Fischer & Reichenow, tom. cit. p. 345.

Melinda; Ugogo.

This species ranges throughout the whole of South Africa, and extends northward on the east coast to about 3° S. lat., having been

collected by Dr. Hildebrandt at Ndi, and by Dr. Fischer at Mombas and Muniuni.

80. *LANIUS CAUDATUS*.

*Lanius caudatus*, Cab., Finsch & Hartl. Vög. Ostaf. p. 330; Cab. J. f. O. 1878, p. 226; Fischer & Reichenow, tom. cit. p. 259; Fischer, tom. cit. p. 276; id. J. f. O. 1879, pp. 294, 302, 303; Fischer & Reichenow, tom. cit. p. 347; Gurney, Ibis, 1881, p. 126.

Lamo; Melinda; Dar-es-Salaam.

This species is apparently confined to East Africa, where it ranges from Lamo to Dar-es-Salaam.

81. *LANIUS COLLURIO*.

*Lanius collurio*, Linn., Finsch & Hartl. Vög. Ostaf. p. 331; Fischer, J. f. O. 1877, pp. 172, 180; Fischer & Reichenow, J. f. O. 1878, p. 259.

Usambara hills; Usambara mountains.

The Red-backed Shrike ranges throughout the whole of North, East, and South Africa, but has not yet been recorded from the west coast.

82. *TELEPHONUS ERYTHROPTERUS*.

*Telephonus erythropterus* (Shaw), Finsch & Hartl. Vög. Ostaf. p. 336; Sharpe, P. Z. S. 1873, p. 714; Nicholson, P. Z. S. 1878, p. 357; Fischer & Reichenow, J. f. O. 1878, p. 259; Fischer, tom. cit. p. 276; id. J. f. O. 1879, pp. 287, 303; Fischer & Reichenow, tom. cit. p. 347.

*Pomatorhynchus erythropterus*, Cab. J. f. O. 1878, p. 224.

Lamo; Usambara hills; Usambara mountains.

This species inhabits the whole of Africa.

83. *TELEPHONUS TRIVIRGATUS*.

*Telephonus trivirgatus*, Smith, Finsch & Hartl. Vög. Ostaf. p. 338.

Usambara hills.

This species ranges from Abyssinia throughout East and South Africa, and on the west from Angola to the Loango coast.

84. *TELEPHONUS ANCHIETÆ*.

*Telephonus anchietæ*, Bocage, Journ. Acad. Sc. Lisboa, no. viii. 1870, p. 344; id. Orn. d'Angola, pl. 4.

*Telephonus minutus*, Bocage, Orn. d'Angola, p. 255 (1877).

Lamo; Usambara hills.

The specimens sent me by Dr. Kirk are male and female, apparently fully adult. *Telephonus anchietæ* is, in my opinion, a good species, readily to be distinguished from *T. minutus*, Hartl. (P. Z. S. 1858, p. 292), by the absence of black on the scapulars. In the male of *T. anchietæ* there is no trace of black on the scapulars; and in the female it is confined to the centres of a few of the larger feathers, and is only visible on these feathers being raised; while in

two males and a female from the Gold Coast, and a male from the Congo, of *T. minutus*, the black on the scapulars is strongly marked as in the type specimen. This species ranges from Lamo to the Quanza, in Angola.

#### 85. DRYOSCOPIUS SUBLACTEUS.

*Laniarius sublacteus* (Cassin), Finsch & Hartl. Vög. Ostaf. p. 347.

*Dryoscopus sublacteus*, Fischer, J. f. O. 1877, p. 207; Fischer & Reichenow, J. f. O. 1878, p. 259; Fischer, tom. cit. p. 274; id. J. f. O. 1879, pp. 277, 303; Fischer & Reichenow, tom. cit. p. 346; Fischer, J. f. O. 1880, p. 189.

*Malaconotus sublacteus*, Cab. J. f. O. 1878, p. 224.

Lamo; Melinda; Pangani.

I only know of this species from the Zanzibar coast and the Gaboon. Cassin's type was procured in the latter locality.

#### 86. DRYOSCOPIUS CUBLA.

*Laniarius cubla* (Shaw), Finsch & Hartl. Vög. Ostaf. p. 345.

*Dryoscopus cubla*, Sharpe, P. Z. S. 1873, p. 714; Cab. J. f. O. 1878, p. 224.

Lamo; Melinda; Pangani; Usambara hills.

Two adult males, compared with Natal specimens, agree perfectly; while two adult females have rather less white on the margins of the wing-feathers than any of my South-African specimens.

This species ranges throughout South Africa, and extends northward, on the east coast, to Lamo.

#### 87. DRYOSCOPIUS AFFINIS.

*Laniarius affinis*, G. R. Gray, Finsch & Hartl. Vög. Ostaf. p. 348.

*Laniarius salimæ*, Finsch & Hartl. tom. cit. p. 349, pl. 5. fig. 3.

*Laniarius orientalis*, Finsch & Hartl. tom. cit. p. 351, pl. 5. fig. 2.

*Dryoscopus salimæ*, Sharpe, P. Z. S. 1873, p. 714; Cab. J. f. O. 1878, p. 224; Fischer & Reichenow, tom. cit. p. 258; Fischer, tom. cit. p. 274; id. J. f. O. 1879, p. 303.

*Dryoscopus affinis*, Fischer, J. f. O. 1877, p. 207; Nicholson, P. Z. S. 1878, p. 357; Fischer & Reichenow, J. f. O. 1878, p. 258; Fischer, tom. cit. p. 274; Gurney, Ibis, 1881, p. 127.

Lamo; Melinda; Pangani; Usambara mountains; Dar-es-Salaam.

In seven males I find a perfect gradation between typical *D. affinis* and typical *D. salimæ*; and there can be no doubt that *D. orientalis* is nothing but the female. This species ranges from Lamo to Dar-es-Salaam, and crosses the continent to the Gaboon.

#### 88. LANIARIUS SULPHUREIPECTUS.

*Laniarius sulfureipectus* (Less.), Finsch & Hartl. Vög. Ostaf. p. 356; Fischer & Reichenow, J. f. O. 1879, p. 346.

Melinda.

This species ranges throughout Africa south of about 15° N. lat.



89. *Nicator gularis*.

*Nicator gularis*, Finsch & Hartl. Vög. Ostaf. p. 360; Cab. J. f. O. 1878, p. 225; Fischer & Reichenow, tom. cit. p. 259; Fischer, tom. cit. p. 277.

Lamo.

This species ranges from Lamo to the Zambesi.

90. *Malacoonotus icterus* (Cuv.).

*Meristes olivaceus*, Finsch & Hartl. Vög. Ostaf. p. 361; Fischer & Reichenow, J. f. O. 1878, p. 259; Fischer, tom. cit. p. 275; id. J. f. O. 1879, pp. 287, 300; Fischer & Reichenow, tom. cit. p. 346; Gurney, Ibis, 1881, p. 126.

Lamo; Usambara mountains; Ugogo; Dar-es-Salaam.

This species ranges throughout Africa south of about 16° N. lat.

*Lanius olivaceus*, Shaw, Gen. Zool. vii. p. 330, refers to a distinct species well figured by Levaillant, Ois. d'Afr. ii. p. 75; so that the title *olivaceus*, Vieill., cannot be here employed.

91. *Prionops talacoma*.

*Prionops talacoma*, Smith, Finsch & Hartl. Vög. Ostaf. p. 365; Sharpe, Cat. B. iii. p. 321.

Ugogo; Dar-es-Salaam.

It ranges from Ugogo southward to the Transvaal, and from thence through the northern portion of South Africa to Damaraland and Angola.

92. *Sigmodus tricolor*.

*Prionops graculinus*, Finsch & Hartl. tom. cit. p. 368; Sharpe, P. Z. S. 1873, p. 714; Cab. J. f. O. 1878, p. 224; Fischer & Reichenow, tom. cit. p. 259; Fischer, tom. cit. p. 275; id. J. f. O. 1879, p. 287; Fischer & Reichenow, tom. cit. p. 347.

*Sigmodus tricolor* (Gray), Sharpe, Cat. B. iii. p. 325.

*Sigmodus graculinus*, Sharpe, loc. cit.; Nicholson, P. Z. S. 1878, p. 357.

Pangani; Usambara hills; Usambara mountains; Dar-es-Salaam.

In my opinion *S. tricolor* and *S. graculinus* are not specifically distinct. They both inhabit the same country north from the Zambesi; the former is known to range to Pangani, and the latter to Mombas. The white bar on the wing is a very variable character; and although present in nine specimens from the above localities, it is reduced in one from Pangani to small, almost obsolete spots, only visible on the fourth and seventh primaries. Four specimens, collected by Dr. Kirk at Dar-es-Salaam, have the white bar on the wing clearly defined, while another specimen from the same locality, presented to me by the late Mr. E. C. Buxton, has no white on the wing, and is a typical example of *S. graculinus*.

I can detect no difference in the colouring of the remainder of the plumage, nor in any of the measurements.

With no white on the quills, *S. graculinus*, Cab.

Dar-es-Salaam. Length 8·8 inches, culmen 0·8, wing 4·6, tail 3·8, tarsus 0·9.

With white on the quills, *S. tricolor*, Gray.

	Length. in.	Culmen. in.	Wing. in.	Tail. in.	Tarsus. in.
Zambesi . . . . .	8·4	0·8	4·85	3·75	0·9
Dar-es-Salaam . . . . .	8·0	0·85	4·7	3·7	0·85
Usambara hills . . . . .	8·5	0·8	4·8	3·85	0·95
Usambara mountains . . . . .	8·35	0·85	4·7	3·75	0·95
Usambara mountains . . . . .	8·3	0·9	4·85	3·8	0·95

93. *SIGMODUS SCOPIFRONS*. (Plate LI. fig. 1.)

*Sigmodus scopifrons*, Peters, J. f. O. 1854, p. 422; Sharpe, Cat. B. iii. p. 324.

*Prionops scopifrons*, Finsch & Hartl. Vög. Ostaf. p. 368.

Lamo; Usambara hills; Usambara mountains.

These are new localities for this rare species, which was formerly only known from the Mosambique.

94. *EUROCEPHALUS ANGUITIMENS*.

*Eurocephalus anguitimens*, Smith, Sharpe, Cat. B. iii. p. 279; Fischer & Reichenow, J. f. O. 1879, p. 347.

Ugogo.

This species ranges throughout South Africa, and extends northward in East Africa to Kibaradja, where it has been collected by Dr. Fischer.

95. *PŒOPTERUS LUGUBRIS*.

*Pœopterus lugubris*, Bp., Sharpe, P. Z. S. 1878, p. 803, pl. 49.

Usambara mountains.

New to East Africa. This species was hitherto only known as a native of West Africa, where it ranges from the Gold Coast to the Gaboon.

96. *CORVUS SCAPULATUS*.

*Corvus scapulatus*, Daud., Finsch & Hartl. Vög. Ostaf. p. 374; Fischer, J. f. O. 1877, pp. 176, 425; Cab. J. f. O. 1878, p. 234; Fischer & Reichenow, tom. cit. p. 261; Fischer, tom. cit. p. 287; id. J. f. O. 1879, pp. 292, 303.

Dar-es-Salaam.

This Crow ranges throughout the Ethiopian Region south of about 20° N. lat.

97. *PHOLIDAUGES VERREAUXI*.

*Pholidauges leucogaster*, Finsch & Hartl. Vög. Ostaf. p. 376 (part).

*Pholidauges verreauxi*, Bocage, Sharpe, P. Z. S. 1873, p. 714;

Nicholson, P. Z. S. 1878, p. 357; Cab. J. f. O. 1878, p. 233; Fischer & Reichenow, tom. cit. p. 261; Gurney, Ibis, 1881, p. 127.

Lamo; Melinda; Usambara hills; Usambara mountains; Dar-es-Salaam.

This and the closely allied *P. leucogaster* together range over the whole of Africa south of about 16° N. lat.,—*P. verreauxi* being confined to the south of the equator, and *P. leucogaster* to the north of the line.

98. NOTAUGES SUPERBUS.

*Notauges superbus* (Rüpp.), Finsch & Hartl. Vög. Ostaf. p. 378; Cab. J. f. O. 1878, p. 233.

Ugogo; Dar-es-Salaam.

This species is confined to East Africa, where it ranges from Dar-es-Salaam northward to about 10° N. lat.

99. LAMPROCOLIUS SYCOBIUS.

*Lamprocolius sycobius*, Peters, Finsch & Hartl. Vög. Ostaf. p. 380; Cab. J. f. O. 1878, p. 233; Fischer & Reichenow, tom. cit. p. 261; Fischer, tom. cit. p. 286; Gurney, Ibis, 1881, p. 127.

Ugogo.

This species ranges from the Zambesi northward to about 2° S. lat. The actual northern limit as yet known for this bird is the Ukambani country, where it has been collected by Dr. Hildebrandt.

100. LAMPROCOLIUS MELANOGASTER.

*Lamprocolius melanogaster* (Swains.), Finsch & Hartl. Vög. Ostaf. p. 381; Fischer & Reichenow, J. f. O. 1878, p. 261; Fischer, tom. cit. p. 286; Gurney, Ibis, 1881, p. 127.

*Lamprotornis melanogaster*, Fischer, J. f. O. 1879, p. 292.

Lamo; Melinda; Pangani.

This species ranges from Lamo southward to Durban in Natal, and to the Knysna in Cape Colony. It is, I believe, nowhere to be met with in West Africa; for I consider the locality Senegal, given by Swainson for this species, to be an error.

101. COSMOPSARUS UNICOLOR.

*Cosmopsarus unicolor*, Shelley, Ibis, 1881, p. 116.

Ugogo.

This is another of the interesting novelties procured by Dr. Kirk, and is the second known species of the genus *Cosmopsarus*, which appears to be confined to East Africa.

102. AMYDRUS RUEPPELLI.

*Amydrus rueppelli*, Verr., Finsch & Hartl. Vög. Ostaf. p. 382.

Ugogo.

This species ranges from Kordofan to Ugogo, but has not yet been recorded from the coast of the Zanzibar province.

## 103. AMYDRUS WALLERI.

*Amydrus walleri*, Shelley, Ibis, 1880, p. 335, pl. 8.

Usambara mountains.

The only specimens known are the types—a male and two females. This species is about one third smaller than the South-African *A. morio*; the bill is proportionally shorter and stouter; and the head, neck, and wings are greener. The sexes differ in a very similar manner to those of *A. morio*.

## 104. HYPHANTORNIS NIGRIFRONS.

*Hyphantornis velatus*, Cab., pt., Finsch & Hartl. Vög. Ostaf. p. 390, note.

?*Hyphantornis cabanisi*, Fischer & Reichenow, J. f. O. 1878, p. 263; Fischer, tom. cit. p. 285.

Lamo; Usambara mountains.

## 105. HYPHANTORNIS NIGRICEPS.

*Hyphantornis nigriceps*, Layard, Finsch & Hartl. Vög. Ostaf. p. 392; Sharpe, P. Z. S. 1873, p. 715; Nicholson, P. Z. S. 1878, p. 358; Cab. J. f. O. 1878, p. 231; Fischer & Reichenow, tom. cit. p. 262; Fischer, J. f. O. 1879, pp. 281, 302; Fischer & Reichenow, J. f. O. 1880, p. 143; Gurney, Ibis, 1881, p. 127.

Lamo; Melinda; Usambara hills; Usambara mountains; Dar-es-Salaam.

This species ranges from Lamo to Mosambique in East Africa, and, according to Mr. Layard, has been collected at Kuruman in South Africa.

## 106. HYPHANTORNIS AUREOFLAVUS.

*Hyphantornis aureoflavus* (Smith), Finsch & Hartl. Vög. Ostaf. p. 400; Fischer, J. f. O. 1877, p. 178; Cab. J. f. O. 1878, p. 231; Fischer & Reichenow, tom. cit. p. 262; Fischer, tom. cit. p. 284; id. J. f. O. 1879, pp. 286, 302; Fischer & Reichenow, J. f. O. 1880, p. 142; Fischer, tom. cit. p. 188.

Pangani.

I am unable to define satisfactorily the range of this species. Its southern limit appears to be Mosambique. On the Zanzibar coast it is plentiful. In the Leiden Museum there is a specimen labelled "Nubia," on the authority of Rüppell; and Sir A. Smith's type came from Sierra Leone (Ill. Zool. S. Afr., note to pl. 30).

## 107. SYCOBROTUS KERSTENI.

*Sycobrotus kersteni*, Finsch & Hartl. Vög. Ostaf. p. 404, pl. 6; Sharpe, P. Z. S. 1873, p. 715; Fischer & Reichenow, J. f. O. 1878, p. 281; Fischer, tom. cit. pp. 285, 291; id. J. f. O. 1879, pp. 281, 288, 302; Fischer & Reichenow, tom. cit. p. 350; id. J. f. O. 1880, p. 143.

Lamo; Usambara mountains.

This species is fairly plentiful throughout the Zanzibar province, and, according to M. Jules Verreaux, occurs in Senegal.

## 108. SYCOBROTUS MELANOXANTHUS.

*Hyphanturgus melanoxanthus*, Cab. J. f. O. 1878, pp. 205, 232; Fischer & Reichenow, tom. cit. p. 363.

Melinda.

The only other locality where this species has been collected is Mombas, where Hildebrandt procured the type, and where Dr. Fischer also met with it.

## 109. SYCOBROTUS NIGRICOLLIS.

*Sycobrotus nigricollis* (Vieill.), Finsch & Hartl. Vög. Ostaf. p. 405.

*Hyphanturgus nigricollis*, Cab. J. f. O. 1878, p. 232; Fischer & Reichenow, tom. cit. p. 263; Fischer, J. f. O. 1879, pp. 280, 288; Fischer & Reichenow, tom. cit. p. 350.

Lamo.

The type of *Ploceus nigricollis*, Vieill., was collected by Perrier in Angola; otherwise I only know of its occurrence on the Zanzibar coast, where it ranges from Lamo to Zanzibar Island.

## 110. PLOCEPASSER MAHALI.

*Philagrus melanorhynchus*, Smith, Cab. J. f. O. 1878, p. 232.

I have in my collection an adult male of this species, collected by Dr. Hildebrandt at Kitui, in Ukamba, in May 1877. I have compared it with South-African specimens from Matabili, Griqualand, and Benguela; and it agrees perfectly. It therefore appears evident to me that *Philagrus melanorhynchus*, Cab. (J. f. O. 1878, p. 232), refers to this species, and that *Plocepasser melanorhynchus*, Rüpp., has not yet been met with to the south of the White-Nile district.

## 111. QUELEA ÆTHIOPICA.

*Ploceus æthiopicus* (Sundev.), Finsch & Hartl. Vög. Ostaf. p. 409, note.

*Hyphantica æthiopica*, Fischer & Reichenow, J. f. O. 1879, p. 352.

Lamo; Ugogo.

This species ranges northward from Ugogo to about 18° N. lat.

## 112. EUPLECTES FLAMMICEPS.

*Pyromelana flammiceps*, Swains., Finsch & Hartl. Vög. Ostaf. p. 414.

*Euplectes flammiceps*, Cab. J. f. O. 1878, p. 231; Fischer & Reichenow, tom. cit. p. 263; Fischer, J. f. O. 1879, pp. 280, 282, 289, 303; Fischer & Reichenow, tom. cit. p. 351; Fischer, J. f. O. 1880, p. 187.

Melinda; Usambara hills; Usambara mountains.

It ranges over the greater portion of tropical Africa, being met with in East Africa from Abyssinia to Zanzibar, and on the west coast from Senegal to Angola.

113. *EUPLECTES NIGRIVENTRIS*.

*Pyromelana nigriventris* (Cass.), Finsch & Hartl. Vög. Ostaf. p. 415; Fischer, J. f. O. 1877, pp. 171, 179, 206, 208, 425, 426; Gurney, Ibis, 1881, p. 128.

*Euplectes nigriventris*, Sharpe, P. Z. S. 1873, p. 715; Nicholson, P. Z. S. 1878, p. 358; Cab. J. f. O. 1878, p. 231; Fischer & Reichenow, tom. cit. p. 264; Fischer, J. f. O. 1879, pp. 286, 303; Fischer, J. f. O. 1880, pp. 187, 190, 192.

Lamo; Pangani; Ugogo.

This species is confined to East Africa, where it ranges from Mombas to Mosambique.

114. *EUPLECTES XANTHOMELAS*.

*Pyromelana capensis* (part.), Finsch & Hartl. Vög. Ostaf. p. 416.

*Euplectes capensis*, Nicholson, P. Z. S. 1878, p. 358; Fischer & Reichenow, J. f. O. 1878, p. 264.

*Oryx xanthomelas* (Rüpp.), Cab. J. f. O. 1878, p. 231; Fischer & Reichenow, J. f. O. 1879, p. 351.

Lamo; Usambara mountains; Ugogo; Dar-es-Salaam.

Swainson records *E. capensis* from Senegal; and were it not that I doubt the authenticity of Swainson's locality, I should expect his bird to belong to the present species, which is known to range from Abyssinia, throughout East Africa, to Natal. The larger but closely allied *E. capensis* ranges from Natal and the Transvaal, throughout the western portion of South Africa, to Angola.

115. *UROBRACHYA ZANZIBARICA*, sp. n.

?*Penthetria axillaris*, Cab. J. f. O. 1878, p. 231; Fischer & Reichenow, tom. cit. p. 264; Fischer, tom. cit. p. 283; id. J. f. O. 1879, p. 286; Fischer & Reichenow, tom. cit. p. 351.

Lamo; Melinda; Pangani; Usambara mountains.

Similar in size and general plumage to *U. axillaris* (Smith), but differs in the far greater amount of rufous-brown on the primary- and greater wing-coverts; primary-coverts rufous-brown, only tipped with black; greater wing-coverts rufous-brown; the outer feather with the end and the end-half of the outer web black; about five of the inner greater coverts are black, edged with rufous-brown; and in the next three or four the black becomes limited to spots near the ends of the inner webs, the remaining five or six greater wing-coverts being entirely without any black portions.

Total length 6·5 inches, culmen 0·65, wing 3·5, tail 2·7, tarsus 1.

I have compared eight adult males of this species from the above localities with seven specimens of *U. axillaris* from Natal, and find the characters mentioned perfectly constant.

116. *VIDUA PARADISEA*.

*Vidua paradisea* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 424.

*Vidua verreauxi*, Finsch & Hartl. tom. cit. p. 426; Fischer,

J. f. O. 1879, pp. 299, 303; Fischer & Reichenow, tom. cit. p. 351.

*Steganura spheura*, Cab. J. f. O. 1878, p. 231.

Lamo; Ugogo; Dar-es-Salaam.

The characters of *V. verreauxi*, Cass., are, in my opinion, not of specific value. The range, therefore, of this species is from 17° N. lat. to 21° S. lat.

#### 117. VIDUA PRINCIPALIS.

*Vidua principalis* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 428; Cab. J. f. O. 1878, p. 230; Fischer & Reichenow, tom. cit. p. 264; Fischer, J. f. O. 1879, pp. 280, 300, 303; Fischer & Reichenow, tom. cit. p. 351; Gurney, Ibis, 1881, p. 128.

*Vidua serena*, Fischer, J. f. O. 1878, p. 282.

Lamo; Pangani; Usambara hills; Usambara mountains; Dar-es-Salaam.

This species ranges throughout Africa south of about 16° N. lat.

#### 118. VIDUA SPLENDENS, Reichenow.

*Vidua splendens*, Reichenow, Orn. Centralbl. 1879, p. 180; Fischer, J. f. O. 1879, p. 300; Reichenow & Schallow, tom. cit. p. 326; Fischer & Reichenow, tom. cit. p. 352; Forbes, P. Z. S. 1880, p. 475, pl. 47. fig. 1.

Ugogo.

Besides the present locality this species is only known from Kibara, where the type was collected by Dr. Fischer.

#### 119. SPERMESTES CUCULLATUS.

*Spermestes cucullatus*, Swains., Finsch & Hartl. Vög. Ostaf. p. 436; Sharpe, P. Z. S. 1873, p. 715; Fischer, J. f. O. 1877, pp. 174, 178, 179, 206, 425, 426; Cab. J. f. O. 1878, p. 230; Fischer & Reichenow, tom. cit. p. 266; Fischer, J. f. O. 1879, pp. 286, 303; 1880, pp. 187, 193.

Pangani; Usambara mountains; Dar-es-Salaam.

This species ranges over the whole of Africa south of about 16° N. lat.

#### 120. HABROPYGA MINOR, Cab.

*Habropygga astrild*, Finsch & Hartl. Vög. Ost-Afr. p. 439; Fischer, J. f. O. 1877, p. 426.

*Habropygga minor*, Cab. J. f. O. 1878, p. 229; Fischer and Reichenow, J. f. O. 1878, p. 266.

Melinda; Pangani; Ugogo.

Nine specimens sent me by Dr. Kirk have the cheeks, chin, and throat whiter than in *H. astrild*, Linn. This appears to me to be the best-marked character for *H. minor*, Cab., which I cannot look upon as more than a local race of *H. astrild*, Linn.

With regard to *H. astrild* and its allies, they range throughout the African region south of about 18° N. lat., and the races possibly

as follows:—*H. minor*, North-east Africa southward to the Zambesi; *H. cinerea*, West Africa from Senegal to the Gaboon: *H. astrild*; South Africa, extending into West Africa northward to the Congo, and found as an introduced bird on many of the islands, as St. Helena and Mauritius.

121. *PITYLIA CINEREIGULA*.

*Pitylia cinereigula*, Cab. J. f. O. 1878, pp. 101, 230; Fischer & Reichenow, tom. cit. p. 265; Fischer, tom. cit. p. 193.

Lamo; Dar-es-Salaam.

This species ranges from Lama to Dar-es-Salaam, and is apparently confined to the Zanzibar province.

122. *LAGONOSTICTA MINIMA*.

*Pytelia minima* (Vieill.), Finsch & Hartl. Vög. Ostaf. p. 444; Fischer & Reichenow, J. f. O. 1878, p. 265; Fischer, tom. cit. p. 282; id. J. f. O. 1879, pp. 280, 286.

*Lagonosticta minima*, Cab. J. f. O. 1878, p. 230; Fischer & Reichenow, J. f. O. 1878, p. 352.

Lamo; Usambara hills; Usambara mountains.

This species ranges in East Africa from about 10° N. lat. to the Transvaal, and on the west coast from Senegal to Damara-land.

123. *LAGONOSTICTA POLIONOTA*.

*Lagonosticta polionota*, Shelley, Cab. J. f. O. 1878, p. 230.

Dar-es-Salaam.

This species ranges in East Africa from Mombas to Dar-es-Salaam, and in West Africa from Fantee to the Loango coast.

124. *URÆGINTHUS PHÆNICOTIS*.

*Pytelia phœnicotis* (Swains.), Finsch & Hartl. Vög. Ostaf. p. 447; Fischer & Reichenow, J. f. O. 1878, p. 265; Fischer, tom. cit. pp. 281, 282; id. J. f. O. 1879, p. 286.

*Estrela cyanogastra*, Nicholson, P. Z. S. 1878, p. 358.

*Uræginthus phœnicotis*, Cab. J. f. O. 1871, p. 229.

*Mariposa phœnicotis*, Gurney, Ibis, 1881, p. 128.

Dar-es-Salaam.

This species ranges throughout Africa south of about 15° N. lat.

The oldest title of this bird is, I consider, *Fringilla bengalus*, Linn. S. N. i. p. 323; but that title should not be employed, as the species is not a native of Bengal.

125. *HYPARGUS NIVEIGUTTATUS*. (Plate LII. fig. 2.)

*Spermophaga niveiguttata*, Peters, J. f. O. 1868, p. 133; Cab. J. f. O. 1878, p. 230.

*Hypargos niveiguttata*, Finsch & Hartl. Vög. Ostaf. p. 448; Fischer, J. f. O. 1879, p. 280.

Melinda; Usambara hills; Usambara mountains.

This rare Finch ranges from Ndi in the Uteita country southward



to Inhambane, near the mouth of the Limpopo, where the type was collected.

126. *AMBLIOSPIZA UNICOLOR*.

*Pyronestes albifrons*, Sharpe, P. Z. S. 1873, p. 715.

*Pyronestes unicolor*, Fischer & Reichenow, J. f. O. 1878, p. 264 ; Fischer, tom. cit. pp. 283, 354 ; id. J. f. O. 1879, pp. 280, 303 ; Fischer & Reichenow, tom. cit. p. 353 ; Fischer, J. f. O. 1880, p. 193.

Lamo ; Pangani ; Usambara mountains.

This species is confined to East Africa, where as yet it is only known of from the northern half of the Zanzibar province.

It differs from the South-African *P. albifrons* in its smaller size and darker colouring. The young, as in the South-African species, has the bill bright yellow, the plumage much paler and more rufous than in the adult, and the breast mottled with whitish.

127. *PASSER SWAINSONI*.

*Passer swainsoni* (Rüpp.), Finsch & Hartl. Vög. Ostaf. p. 450 (pt.) ; Fischer, J. f. O. 1877, p. 180 ; Fischer & Reichenow, J. f. O. 1878, p. 266 ; Fischer, tom. cit. p. 281 ; id. J. f. O. 1879, pp. 286, 302.

Melinda.

In Africa there are three closely allied species of Sparrows, which Drs. Finsch and Hartlaub (*loc. cit.*) unite as one. These are :—

*P. swainsoni*, Rüpp.

*P. gularis*, Less. (The title *P. simplex*, Licht., was misapplied to this species by Swainson.)

*P. diffusus*, Smith.

Collectively they range over the whole of Africa south of about 15° N. lat.

*P. swainsoni* inhabits the north-eastern region to as far south as Zanzibar ; *P. gularis*, West Africa, from Senegal to the Gold Coast ; *P. diffusus*, the whole of South Africa and the east coast northward to Lamo.

Although *P. swainsoni* and *P. diffusus* meet in East Africa, they preserve their identity, and therefore cannot, in my opinion, be regarded as mere races of one species.

128. *PASSER DIFFUSUS*, Smith.

*Passer diffusus*, Nicholson, P. Z. S. 1878, p. 358 ; Cab. J. f. O. 1878, p. 228 ; Fischer & Reichenow, J. f. O. 1880, p. 143.

Lamo ; Pangani ; Dar-es-Salaam.

129. *CRITHAGRA CHRYSOPYGA*.

*Crithagra butyracea*, Finsch & Hartl. Vög. Ostaf. p. 455 (part) ; Fischer, J. f. O. 1877, pp. 181, 206 ; id. J. f. O. 1879, pp. 280, 300, 303,

*Crithagra chrysopyga* (Swains.), Sharpe, P. Z. S. 1873, p. 715; Fischer & Reichenow, J. f. O. 1878, p. 266.

Lamo; Usambara hills.

This species ranges throughout South Africa and West Africa to as far north as Senegal. On the east coast it extends certainly as far north as Lamo, and probably considerably further in this direction; but as yet I am unable to determine how much of Von Heuglin's *C. butyracea* may belong to this species.

### 130. *COLIUS LEUCOTIS*, Rüpp.

*Colius leucotis*, Finsch & Hartl. Vög. Ostaf. p. 472; Sharpe, P. Z. S. 1873, p. 714; Nicholson, P. Z. S. 1878, p. 358; Cab. J. f. O. 1878, p. 237; Fischer & Reichenow, tom. cit. p. 252; Fischer, tom. cit. pp. 269, 289, 290; id. J. f. O. 1879, pp. 282, 300, 303; Gurney, Ibis, 1881, p. 128.

Pangani; Usambara mountains; Dar-es-Salaam.

This species is confined to East Africa, where it ranges from about 10° N. lat. to Dar-es-Salaam.

### 131. *GALLIREX CHLOROCHLAMYS*.

*Corythaix porphyreolophus*, Finsch & Hartl. Vög. Ostaf. p. 473. *Gallirex chlorochlamys*, Shelley, Ibis, 1881, p. 118.

Ugogo; Dar-es-Salaam.

Three specimens from the above localities I have made the types of this new species. It is the East-African representative of *G. porphyreolophus* (Vig.), from which latter bird it may be most readily distinguished by the absence of any red shade to the green of the lower neck, chest, and upper back; while the lower back, median and lesser wing-coverts, and the secondaries are of a more ashy-blue shade.

### 132. *TURACUS FISCHERI*.

*Corythaix fischeri*, Fischer & Reichenow, J. f. O. 1878, p. 250, pl. 4. fig. 1; Fischer, tom. cit. pp. 290, 354; id. J. f. O. 1879, pp. 288, 291, 303; Fischer & Reichenow, tom. cit. p. 340; Fischer, J. f. O. 1880, p. 189.

Lamo; Melinda; Usambara mountains; Rabbai near Mombas (Wakefield).

This species is confined to the Zanzibar province.

We now know of three species of *Turacus* with red on the crest; and these may be readily distinguished in the following manner:—

- a. Greater portion of the crest and nape red. Some of the crest-feathers tipped with white.
- a'. No black loreal band. Sides of the head white, or nearly so..... *erythrolophus*.
- b'. With a black loreal band. Sides of the head grass-green..... *fischeri*.
- b. Red on the crest confined to the tips of a few of the longer feathers. No white on the crest..... *meriani*.

## 133. SCHIZORHIS LEOPOLDI.

*Schizorhis leopoldi*, Shelley, Ibis, 1881, p. 117, pl. 2.

Ugogo.

Allied to *S. personatus*, Rüpp., from which it may be most readily distinguished by its having the bare skin of the face jet-black, no shade of green on the crest or under surface of the tail, and a much smaller patch of green on the lower portion of the throat.

## 134. BUCORVUS ABYSSINICUS (Bodd).

*Tmetoceros abyssinicus*, Finsch & Hartl. Vög. Ostaf. p. 480.

*Buceros abyssinicus*, Fischer, J. f. O. 1879, p. 303.

*Bucorvus abyssinicus*, Elliot, Monogr. Bucerotidæ, part ii. (1877).  
Usambara hills.

## 135. BYCANISTES CRISTATUS.

*Buceros cristatus*, Rüpp., Finsch & Hartl. Vög. Ostaf. p. 482;  
Fischer & Reichenow, J. f. O. 1880, p. 141.

*Bycanistes cristatus*, Elliot, Monogr. Bucerotidæ, part iii. (1877).  
Usambara hills.

This species is confined to East Africa, ranging from Uganda (where it was collected by Captain Speke) to the Zambesi.

## 136. BYCANISTES BUCCINATOR.

*Buceros buccinator*, Temm., Finsch & Hartl. Vög. Ostaf. p. 484; Fischer & Reichenow, J. f. O. 1878, p. 254; Fischer, tom. cit. pp. 273, 289; id. J. f. O. 1879, p. 291; Fischer & Reichenow, J. f. O. 1880, p. 141.

*Bycanistes buccinator*, Elliot, Monogr. Bucerotidæ, part viii. (1880).

Melinda; Usambara mountains.

Dr. Fischer procured it at Wito, its most northern known limit, whence it ranges southward to Natal and the Cape colony.

## 137. TOCCUS MELANOLEUCUS.

*Buceros melanoleucus*, Licht., Finsch & Hartl. Vög. Ostaf. p. 485; Fischer & Reichenow, J. f. O. 1878, p. 254; Fischer, tom. cit. p. 289; id. J. f. O. 1879, p. 291; Fischer & Reichenow, tom. cit. p. 343; id. J. f. O. 1880, p. 141.

*Tockus melanoleucus*, Nicholson, P. Z. S. 1878, p. 358; Elliot, Monogr. Bucerotidæ, part vii. (1880).

*Lophoceros melanoleucus*, Cab. J. f. O. 1878, p. 236.

Pangani; Usambara mountains; Dar-es-Salaam.

It ranges throughout South Africa, and on the east coast northward nearly to the equator, and on the west coast to Angola. It has also been recorded from Senegal on the authority of Mr. Warwick.

## 138. PŒOCEPHALUS FUSCICAPILLUS.

*Pionias fuscicapillus* (Verr. & Des Murs), Finsch & Hartl. Vög. Ostaf. p. 499, pl. 7; Cab. J. f. O. 1878, p. 241; Fischer &

Reichenow, tom. cit. p. 251 ; Fischer, tom. cit. pp. 269, 286, 292 ; id. J. f. O. 1879, p. 303.

*Pæocephalus fuscicapillus*, Sharpe, P. Z. S. 1873, p. 711 ; Nicholson, P. Z. S. 1878, p. 358 ; Fischer, J. f. O. 1880, p. 188 ; Gurney, Ibis, 1881, p. 128.

Usambara mountains ; Ugogo ; Dar-es-Salaam.

This species ranges from Mombas to as far south as Swazi Land, in which latter locality it has been collected by Mr. T. E. Buckley.

### 139. *POGONORHYNCHUS IRRORATUS*.

*Pogonorhynchus torquatus*, Finsch & Hartl. Vög. Ostaf. p. 503 ; Heugl. Orn. N.O.-Afr. p. 756 ; Sclat. P. Z. S. 1864, p. 112 ; Sharpe, P. Z. S. 1873, p. 711 ; Fischer, J. f. O. 1879, pp. 283, 291.

*Pogonorhynchus irroratus*, Cab. J. f. O. 1878, pp. 205, 239 ; Fischer & Reichenow, tom. cit. p. 253 ; Fischer, tom. cit. p. 292 ; Gurney, Ibis, 1881, p. 128.

Lamo ; Melinda ; Usambara mountains ; Ugogo ; Dar-es-Salaam.

This species ranges from Lamo to Dar-es-Salaam. It is represented in South Africa by the closely allied *P. torquatus* (Dumont).

### 140. *POGONORHYNCHUS MELANOPTERUS*.

*Pogonorhynchus melanopterus* (Peters), Finsch & Hartl. Vög. Ostaf. p. 504 ; Marshall, Monogr. Cap. p. 13, pl. 7 ; Nicholson, P. Z. S. 1878, p. 359 ; Cab. J. f. O. 1878, p. 239 ; Fischer & Reichenow, tom. cit. p. 253 ; Fischer, tom. cit. p. 292 ; id. J. f. O. 1879, p. 291 ; Fischer & Reichenow, tom. cit. p. 342.

Lamo ; Pangani ; Usambara hills ; Usambara mountains ; Ugogo.

It ranges from Lamo to the Mosambique, and has been recorded from West Africa ; but I think there may be doubts as to the correctness of this latter locality. One specimen from the Usambara hills, apparently an immature bird, has rather less red on the head, the back and the front of the chest are rather darker, the bill is a little shorter, and there is no tooth on the upper mandible.

### 141. *POGONORHYNCHUS ALBICAUDA*.

*Pogonorhynchus albicauda*, Shelley, Ibis, 1881, p. 117.

*Pogonorhynchus leucocephalus*, Cab. J. f. O. 1878, p. 239.

Ugogo.

A single specimen is all we possess of this species. It is allied to *P. leucocephalus* (Defil.) ; but may be readily distinguished by its white tail.

### 142. *TRACHYPHONUS CAFER*.

*Trachyphonus cafer* (Vieill.), Marshall, Monogr. Cap. p. 139, pl. 56.

Ugogo.

The present species was hitherto only known as a native of South Africa, where it appears as rather a scarce bird, excepting in the Matabili country and the northern portion of the Transvaal.

143. *BARBATULA OLIVACEA*.

*Barbatula olivacea*, Shelley, Ibis, 1880, p. 334, pl. 7.

Rabbai, near Mombas (*Wakefield*).

I procured a single specimen, the type, out of a small collection made by the Rev. T. Wakefield. This species may be easily recognized by its general olive colour only shading into black on the front of the head.

144. *PICUS NUBICUS*.

*Picus nubicus*, Gm., Finsch & Hartl. Vög. Ostaf. p. 509; Fischer & Reichenow, J. f. O. 1878, p. 253; Fischer, tom. cit. p. 292; id. J. f. O. 1879, p. 289.

*Ipagrus nubicus*, Cab. J. f. O. 1878, p. 239.

Lamo.

This species is confined to East Africa, where it ranges from 20° N. lat. in Nubia to Mombas.

145. *DENDROBATES SCHOËNSIS*.

*Picus schoënsis*, Rüpp., Fischer & Reichenow, J. f. O. 1879, p. 343.

Ugogo.

Dr. Fischer collected this species at Muniuni. It ranges in East Africa from Ugogo to about 10° N. lat. In South Africa it is represented by the closely allied *D. namaqueus*.

146. *PICUS FULVISCAPUS*.

*Picus hartlaubi*, Finsch & Hartl. Vög. Ostaf. p. 512; Sharpe, P. Z. S. 1873, p. 711; Fischer, J. f. O. 1877, p. 207; Fischer & Reichenow, J. f. O. 1878, p. 254; Fischer, tom. cit. p. 292.

*Ipoctonus hartlaubi*, Cab. J. f. O. 1878, p. 238.

*Dendropicus fulviscapus*, Ill., Gurney, Ibis, 1879, p. 298.

Pangani; Usambara hills; Usambara mountains; Ugogo; Dar-es-Salaam.

This species ranges throughout Africa south of 40° S. lat.

147. *INDICATOR VARIEGATUS*, Less.

*Indicator variegatus*, Sharpe, new ed. Layard's B. S. Afr. p. 167; Fischer & Reichenow, J. f. O. 1879, p. 342.

Usambara hills.

Dr. Fischer collected this species at Ualimi; and Mr. Sharpe (*l.c.*) records it from Mombas. It ranges through East and South Africa, from Mombas to the Knysna in Cape Colony.

148. *CUCULUS POLIOCEPHALUS*, Lath.

*a.* Lamo (*Kirke*); *b.* Durban (*Gordge*).

The two specimens from Africa are unfortunately both immature; but their small size prevents me from referring them to any hitherto described member of this group from Africa. They agree, however, exactly with an immature specimen of *C. poliocephalus* in Mr. See-

bohm's collection; and I think that the following measurements prove their specific identity:—

	Total length. in.	Culmen. in.	Wing. in.	Tail. in.
a. Lamo . . . . .	9.5	0.65	5.9	5.4
b. Durban . . . . .	10	0.65	5.65	5
c. Juv., Sikkim ..	9.5	0.60	5.8	5.7
d. Ad., Sikkim ..	9.3	0.70	5.75	5.2
e. Madagascar....	11	0.70	6.8	6.3

149. *COCCYSTES JACOBINUS* (Bodd.).

*Coccytes jacobinus*, Sharpe, P. Z. S. 1873, pp. 597, 711; Nicholson, P. Z. S. 1878, p. 359; Gurney, Ibis, 1881, p. 128.

*Coccytes pica*, Cab. J. f. O. 1878, p. 238; Fischer, J. f. O. 1879, p. 303; Fischer & Reichenow, tom. cit. p. 342.

Usambara mountains.

I also possess a specimen from East Africa, collected by the late Mr. E. C. Buxton at Dar-es-Salaam.

This species ranges throughout East and South Africa. Its northern limit on the east coast is the Anseba valley, 16° N. lat., while on the west coast it has not been met with north of Biballa in Benguela.

150. *COCCYSTES AFER*.

*Coccytes afer* (Licht.), Sharpe, P. Z. S. 1873, p. 596.

Usambara hills; Usambara mountains; Dar-es-Salaam.

This species ranges from the White-Nile district along the east coast to South Africa, and thence on the west coast to as far north as Sierra Leone.

151. *COCCYSTES ALBONOTATUS*, sp. n.

? *Coccytes serratus*, Cab. J. f. O. 1878, p. 237; Fischer & Reichenow, tom. cit. p. 252; Fischer, tom. cit. p. 291.

Usambara hills.

Very similar to *C. serratus*, Sparrm., from which it differs in having a large white spot on the outer webs of the two pairs of lateral tail-feathers, in the under tail-coverts being broadly tipped with white, and in its rather larger dimensions. Total length 14.8 inches, culmen 1.1, wing 6.5, tail 9, tarsus 1.15.

Mr. Gurney first pointed out to me the necessity of separating this species from the South-African *C. serratus*, and writes:—"My specimen from Mombas exactly agrees with your description. The measurements of my bird are as follows—culmen 0.9 inch, wing 6.7, tail 8.9, tarsus 1.2.

152. *CHRYSOCOCYX CUPREUS*.

*Chrysococcyx cupreus* (Bodd.), Finsch & Hartl. Vög. Ostafri. p. 522; Fischer, J. f. O. 1877, pp. 180, 424, 425; Cab. J. f. O. 1878, p. 237; Fischer & Reichenow, tom. cit. p. 252; Fischer, tom

cit. p. 291; id. J. f. O. 1879, pp. 287, 303; Fischer & Reichenow, tom. cit. p. 342; Fischer, J. f. O. 1880, p. 190.

Lamo; Pangani; Usambara hills; Usambara mountains.

A common bird throughout the Zanzibar province. I also possess specimens collected by the Rev. T. Wakefield at Rabbai near Mombas, and by the late Mr. E. C. Buxton at Dar-es-Salaam.

It inhabits the whole of Africa south of about 16° N. lat.

153. *CEUTHMOCHARIS AUSTRALIS*, Sharpe.

*Zanclostomus æreus*, Finsch & Hartl. Vög. Ostaf. p. 525 (part); Fischer, J. f. O. 1880, p. 192.

*Ceuthmocharis australis*, Cab. J. f. O. 1878, p. 238.

*Zanclostomus australis*, Fischer, J. f. O. 1879, pp. 283, 289, 393; Fischer & Reichenow, tom. cit. p. 342.

Lama.

This species ranges throughout South and East Africa to as far north as Lama. In West Africa it is replaced by the nearly allied *C. æneus*.

154. *CENTROPUS SUPERCILIOSUS*.

*Centropus senegalensis*, Finsch & Hartl. Vög. Ostaf. p. 527, part.

*Centropus superciliosus*, Hempr. & Ehr., Fischer, J. f. O. 1877, pp. 172, 175; Nicholson, P. Z. S. 1878, p. 359; Cab. J. f. O. 1878, p. 238; Fischer & Reichenow, tom. cit. p. 252; Fischer, tom. cit. p. 290; id. J. f. O. 1879, p. 282; Fischer & Reichenow, tom. cit. p. 341; Fischer, tom. cit. p. 192.

Pangani.

This species ranges in East Africa from about 19° N. lat. to Dar-es-Salaam, and on the west coast has been collected in Angola.

155. *TRERON DELALANDII*.

*Treron delalandii* (Bp.), Finsch & Hartl. Vög. Ostaf. p. 535; Nicholson, P. Z. S. 1878, p. 359; Fischer & Reichenow, J. f. O. 1878, p. 250; Fischer, tom. cit. p. 293.

Ugogo.

The most northern limit as yet known for this species is Mombas, whence it has been recorded by Drs. Fischer and Reichenow, *l. c.* It ranges southward to Natal and Kaffaria.

156. *TRERON WAKEFIELDI*.

*Treron wakefieldi*, Sharpe, P. Z. S. 1873, p. 715, pl. 58. fig. 2; Fischer, J. f. O. 1879, p. 291; Fischer & Reichenow, tom. cit. p. 339; Gurney, Ibis, 1881, p. 128.

Lamo; Usambara mountains.

This species is as yet only known from the restricted region of the northern portion of the Zanzibar province between Lamo and the Pangani river. The characters given for this species by Mr. Sharpe *l. c.* are well marked in the five specimens before me.

157. *TURTUR SEMITORQUATUS*.

*Turtur semitorquatus*, Rüpp., Finsch & Hartl. Vög. Ostaf. p. 541 ; Sharpe, P. Z. S. 1873, p. 715 ; Fischer, J. f. O. 1877, p. 208 ; Fischer & Reichenow, J. f. O. 1878, p. 250 ; Fischer, J. f. O. 1879, pp. 300, 303.

Dar-es-Salaam.

This species ranges throughout Africa south of about 14° N. lat.

158. *TURTUR CAPICOLA* (Sund.).

*Turtur capicola*, Finsch & Hartl. Vög. Ostaf. p. 548 ; Fischer, J. f. O. 1877, p. 208 ; Fischer & Reichenow, J. f. O. 1878, p. 250 ; Fischer, tom. cit. p. 292, 1879, p. 300.

*Turtur albiventris*, Sharpe, P. Z. S. 1873, p. 715.

*Turtur damarensis*, Cab. J. f. O. 1878, p. 242.

Pangani ; Usambara mountains ; Ugogo ; Dar-es-Salaam.

I cannot venture to define the full range of this species until I have had more time to study the African members of the genus *Turtur* ; but the present bird undoubtedly inhabits the whole of South Africa, and ranges northward along the east coast to Mombas, and is plentiful on the Comoro Islands.

159. *TURTUR LUGENS*.

*Turtur lugens* (Rüpp.), Heugl. Orn. N.O.-Afr. p. 838.

Pangani.

The present species is here recorded from the East-African region for the first time. It ranges from Abyssinia to the Pangani valley. The specimen before me agrees perfectly with one collected by Sir W. C. Harris at Ankober in Abyssinia, now in the British Museum.

160. *CHALCOPELIA AFRA*.

*Chalcopeelia afra* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 554 (part) ; Sharpe, P. Z. S. 1873, p. 716 ; Fischer, J. f. O. 1877, pp. 173, 175, 176, 207, 208 ; Fischer & Reichenow, J. f. O. 1878, p. 250 ; Fischer, tom. cit. p. 292 ; id. J. f. O. 1879, pp. 300, 303 ; Fischer & Reichenow, tom. cit. p. 339 ; Fischer, J. f. O. 1880, p. 192.

Pangani ; Usambara mountains.

Drs. Finsch and Hartlaub unite as one species the specimens with metallic green and with metallic blue spots on the wings ; but in the present list it is undoubtedly best to treat them as distinct species, although I am unable to define their separate geographical distribution. Collectively they range throughout Africa south of about 17° N. lat.

161. *CHALCOPELIA CHALCOSPILOS*.

*Chalcopeelia afra*, Finsch & Hartl. Vög. Ostaf. p. 554, part.

*Chalcopeelia chalcospilos* (Wagl.), Cab. J. f. O. 1878, p. 243.

Lamo ; Usambara hills ; Usambara mountains ; Dar-es-Salaam.



162. *ÆNA CAPENSIS*.

*Æna capensis* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 557; Sharpe, P. Z. S. 1873, p. 716; Cab. J. f. O. 1878, p. 243.

Lamo; Pangani.

It ranges throughout Africa south of about 15° N. lat., occasionally extending, probably as a straggler, somewhat further north; for Mr. Dresser has kindly presented me with a specimen collected by Mr. Zohrab at Jeddah, about lat. 22° N. lat., on the Asiatic side of the Red Sea.

163. *PERISTERA TYMPANISTRIA*.

*Peristera tympanistria* (Temm.), Finsch & Hartl. Vög. Ostaf. p. 558; Fischer, J. f. O. 1877, pp. 173, 176; Cab. J. f. O. 1878, p. 243; Fischer & Reichenow, tom. cit. p. 250; Fischer, tom. cit. pp. 292, 293.

*Chalcopelia tympanistria*, Fischer, J. f. O. 1879, p. 300.

Pangani.

It ranges throughout South Africa, and extends northward in East Africa to Mombas, and in West Africa to the Gold Coast.

164. *NUMIDA PUCHERANI*.

*Numida pucherani*, Hartl., Finsch & Hartl. Vög. Ostaf. p. 574; Elliot, Monogr. Phasianidæ, ii. pl. 46; Fischer & Reichenow, J. f. O. 1878, p. 250; Fischer, tom. cit. pp. 293, 294; id. J. f. O. 1879, pp. 284, 300; Fischer & Reichenow, J. f. O. 1880, p. 140; Sci. P. Z. S. 1880, p. 539.

*Numida ellioti*, Bartlett, P. Z. S. 1877, p. 652, pl. 65.

*Guttura pucherani*, Cab. J. f. O. 1878, p. 244.

Melinda; Pangani.

This species is confined to East Africa, and is apparently the commonest Guineafowl on the Zanzibar coast, while, according to Dr. Kirk, it is plentiful along the Zambesi.

165. *FRANCOLINUS NUDICOLLIS*.

*Francolinus nudicollis* (Gm.), Fischer, J. f. O. 1879, p. 284; Fischer & Reichenow, tom. cit. p. 339.

Dar-es-Salaam.

This species was first collected in East Africa by Dr. Fischer at Kipini.

166. *FRANCOLINUS GRANTI*.

*Francolinus grantii*, Hartl., Finsch & Hartl. Vög. Ostaf. p. 589; Nicholson, P. Z. S. 1878, p. 359; Fischer, J. f. O. 1879, pp. 284, 300, 303; Fischer & Reichenow, tom. cit. p. 339.

*Scleroptera grantii*, Cab. J. f. O. 1878, p. 243.

Melinda; Dar-es-Salaam.

The present species is apparently confined to East Africa, where it ranges from Mombas to Tete on the Zambesi. According to Dr. Hildebrandt it is abundant about Mombas in the Uteita country;

and as I have received it both from Dr. Kirk and the late Mr. E. C. Buxton from Dar-es-Salaam, it is probably fairly evenly distributed throughout the Zanzibar province.

167. *TURNIX LEPURANA*.

*Turnix lepurana* (Smith), Finsch & Hartl. Vög. Ostaf. p. 593 ; Fischer & Reichenow, J. f. O. 1878, p. 249 ; Fischer, tom. cit. p. 293 ; id. J. f. O. 1879, p. 284 ; Fischer & Reichenow, tom. cit. p. 339 ; Fischer, J. f. O. 1880, p. 188.

*Ortygis lepurana*, Cab. J. f. O. 1878, p. 243.

Lamo.

From Kordofan it ranges southward throughout East and South Africa. On the west coast I am unable accurately to determine its limits ; but it is certainly a common bird in Fantee, and is probably distributed throughout this region from Senegal to Angola.

Dr. Fischer found it breeding on Zanzibar Island and at Formosa Bay, and he gives a description of the eggs.

168. *ÆDICNEMUS VERMICULATUS*.

*Ædicnemus vermiculatus*, Cab., Finsch & Hartl. Vög. Ostaf. p. 622 ; Cab. J. f. O. 1878, p. 245 ; Fischer, J. f. O. 1879, p. 303 ; Fischer & Reichenow, tom. cit. p. 338.

Usambara mountains.

This species ranges from Mombas southward throughout East and South Africa.

169. *CURSORIUS SENEGALENSIS* (Licht.).

Melinda.

This species ranges throughout Africa south of about 15° N. lat. It is here recorded for the first time from East Africa.

170. *GLAREOLA PRATINCOLA*.

*Glareola pratincola* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 630.

Melinda.

The Common Pratincole ranges throughout Africa.

171. *CHETTUSIA INORNATA*.

*Chettusia inornata* (Swains.), Fischer & Reichenow, J. f. O. 1880, p. 139.

Melinda.

I cannot attempt to define the range of this species, as there appears to me to be much confusion in the nomenclature. The present species is closely allied to *C. melanoptera* (Rüpp.), from which it may be readily distinguished by its smaller size, longer tarsus, black legs, and in the bar on the tail not extending onto the two outer feathers on each side, which are entirely white.

Dr. Fischer first collected this bird in East Africa, on the island of Zanzibar.

172. *DROMAS ARDEOLA*.

*Dromas ardeola*, Paykull, Finsch & Hartl. Vög. Ostaf. p. 627.

Dar-es-Salaam.

It ranges throughout the whole of the East-African coast from Natal to Massuah on the Red Sea, and also inhabits Madagascar and the Seychelles Islands.

173. *ARDEA MELANOCEPHALA*.

*Ardea melanocephala*, Vig., Finsch & Hartl. Vög. Ostaf. p. 680; Fischer, J. f. O. 1879, pp. 284, 295, 297; Gurney, Ibis, 1881, p. 128.

Usambara hills.

It inhabits the entire Ethiopian region south of 14° N. lat.

174. *HERODIAS INTERMEDIA* (Wagl.).

*Ardea intermedia*, Finsch & Hartl. Vög. Ostaf. p. 686.

? *Ardea alba*, Fischer, J. f. O. 1879, pp. 295, 295.

Usambara hills.

It inhabits Africa south of 15° N. lat. To the north, at least along the shores of the Mediterranean, it is, I believe, entirely replaced by the larger form *H. alba* (Linn.).

175. *HERODIAS GARZETTA*.

*Ardea garzetta* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 687; Fischer, J. f. O. 1879, pp. 295, 297.

Usambara hills.

This species ranges throughout the entire Ethiopian region.

176. *BUBULCUS IBIS* (Linn.).

*Ardea bubulcus*, Finsch & Hartl. Vög. Ostaf. p. 694.

*Bubulcus ibis*, Cab. J. f. O. 1878, p. 245.

Usambara hills.

It inhabits the entire Ethiopian region.

177. *ARDETTA STURMI*.

*Ardea sturmi*, Wagl., Finsch & Hartl. Vög. Ostaf. p. 704.

Pangani.

It inhabits the entire Ethiopian Region south of about 15° N. lat., but is here recorded for the first time from the Zanzibar province.

178. *ARDETTA MINUTA* (Linn.).

*Ardea minuta*, Finsch & Hartl. Vög. Ostaf. p. 705.

*Ardea podiceps*, Finsch & Hartl. tom. cit. p. 708.

*Ardetta pusilla*, Cab. J. f. O. 1878, p. 245.

*Botaurus minutus*, Fischer & Reichenow, tom. cit. p. 249.

*Botaurus pusillus*, Fischer & Reichenow, loc. cit.

Pangani.

I have given above references to both *Ardetta minuta* (Linn.) and *A. pusilla* (Vieill.), as they are so closely allied that I consider

their specific separation unnecessary. The two specimens sent to me by Dr. Kirk from Pangani I should refer to the true *A. minuta*. Both forms, according to Dr. Fischer, occur on the island of Zanzibar. Collectively they range throughout the Ethiopian Region.

179. *SCOPUS UMBRETTA*.

*Scopus umbretta*, Gm., Finsch & Hartl. Vög. Ostaf. p. 727; Cab. J. f. O. 1878, p. 245; Fischer & Reichenow, tom. cit. p. 249; Fischer, tom. cit. p. 295; id. J. f. O. 1879, pp. 284, 296, 297, 301; Fischer & Reichenow, tom. cit. p. 339.

Usambara hills.

This species ranges throughout the Ethiopian region south of about 15° N. lat.

180. *IBIS ÆTHIOPICA*.

*Ibis æthiopica* (Lath.), Finsch & Hartl. Vög. Ostaf. p. 733; Fischer & Reichenow, J. f. O. 1878, p. 248; Fischer, tom. cit. p. 295; id. J. f. O. 1879, pp. 295, 296.

Usambara hills.

I may here mention that I have recently received from M. Filipponi an Egyptian specimen shot on Lake Mensala, in the Delta; so that this species is now known to range in Africa from the mouth of the Nile to the Cape of Good Hope, and on the west coast as far north as the Senegal river.

181. *GERONTICUS HAGEDASH*.

*Ibis hagedash* (Lath.), Finsch & Hartl. Vög. Ostaf. p. 735; Fischer, J. f. O. 1879, pp. 295, 296.

*Ibis caffrensis*, Fischer & Reichenow, J. f. O. 1878, p. 248.

Usambara hills.

It ranges throughout Africa south of the line, and northward in Western Africa to the river Gambia.

182. *TOTANUS CANESCENS*.

*Totanus canescens* (Gm.), Finsch & Hartl. Vög. Ostaf. p. 745.

Usambara mountains.

It ranges throughout the whole of Africa.

183. *CALIDRIS ARENARIA*.

*Calidris arenaria* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 767.

Lamo.

It inhabits the entire Ethiopian Region.

184. *RHYNCHÆA CAPENSIS*.

*Rhynchæa capensis* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 774.

Lamo.

Although here recorded for the first time from the Zanzibar region, it ranges throughout the whole of Africa and Madagascar.

185. *LIMNOCORAX NIGER*.

*Ortygometra nigra* (Gm.), Finsch & Hartl. Vög. Ostaf. p. 779; Fischer & Reichenow, J. f. O. 1878, p. 248; Fischer, tom. cit. p. 295; id. J. f. O. 1879, pp. 297, 303; Fischer, J. f. O. 1880, p. 188.

*Limnecorax mosambicus*, Cab. J. f. O. 1878, p. 246.

Pangani; Dar-es-Salaam.

This species inhabits the whole of Africa south of about 13° N. lat., and on the west coast extends a few degrees further north, to the river Senegal.

186. *METOPIDIUS AFRICANUS*.

*Parra africana* (Gm.), Finsch & Hartl. Vög. Ostaf. p. 781; Fischer & Reichenow, J. f. O. 1878, p. 248; Fischer, tom. cit. p. 295; Fischer, J. f. O. 1879, pp. 297, 303; Fischer & Reichenow, tom. cit. p. 338; Fischer, J. f. O. 1880, p. 188.

Pangani.

It inhabits the whole of Africa south of about 15° N. lat.

187. *GALLINULA ANGULATA*.

*Gallinula pumila*, Sclat. Ibis, 1859, p. 249, pl. 7.

Dar-es-Salaam.

New to East Africa. This species ranges throughout South Africa, and extends northward on the west coast to Senegal and on the east coast to Dar-es-Salaam.

188. *SARCIDIORNIS AFRICANUS*.

*Sarcidiornis melanotus* (Penn.), Finsch & Hartl. Vög. Ostaf. p. 799; Fischer, J. f. O. 1879, p. 296.

Melinda.

This species ranges throughout the Ethiopian Region south of about 15° N. lat.

189. *NETTAPUS AURATUS*.

*Nettapus auratus* (Bodd.), Finsch & Hartl. Vög. Ostaf. p. 804; Fischer & Reichenow, J. f. O. 1878, p. 248; Fischer, tom. cit. p. 296; id. J. f. O. 1879, p. 285.

Lamo.

It ranges throughout the whole of the southern Ethiopian Region, and extends northward on the east coast to Lamo, and in West Africa to Senegal.

190. *DENDROCYGNA VIDUATA*.

*Dendrocygna viduata* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 806; Fischer & Reichenow, J. f. O. 1878, p. 248; Fischer, tom. cit. p. 295; id. J. f. O. 1879, pp. 295, 296.

Ugogo.

This species ranges throughout the Ethiopian Region south of about 16° N. lat.

191. *PODICEPS MINOR.*

*Podiceps minor* (Linn.), Finsch & Hartl. Vög. Ostaf. p. 811; Fischer, J. f. O. 1880, p. 188.

*Colymbus minor*, Fischer & Reichenow, J. f. O. 1878, p. 247; Fischer, J. f. O. 1879, p. 297.

Pangani.

This species is to be found throughout the whole of the Ethiopian Region.

192. *THALACROCORAX AFRICANUS.*

*Graculus africanus* (Gm.), Finsch & Hartl. Vög. Ostaf. p. 847; Fischer & Reichenow, J. f. O. 1878, p. 247; Fischer, tom. cit. p. 295.

Usambara hills.

The range of this species is probably the entire Ethiopian Region south of 30° N. lat.; for it is not uncommon on Lake Fayoom near Cairo; but its northern limits on the west coast are not yet so well defined.

7. On a Collection of Lepidoptera from Western India, Beloochistan, and Afghanistan. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c. Assistant Keeper, Zoological Department, British Museum.

[Received March 28, 1881.]

The collection, of which the following is an account, was received last year, in two consignments, from Major Charles Swinhoe. The first of these was accompanied by a letter dated from Kurrachee 1st May, 1880, in which Major Swinhoe says:—"I send you by this mail another small collection of Lepidoptera in three small boxes. . . . I am afraid there is not much in it you will care for. I have several boxes full of Butterflies and Moths in paper envelopes, but cannot find time to sort them. Mr. Murray, the Curator of the Kurrachee Museum, has gone to Kandahar at his and my expense; and when happier times come I will send you his Afghan collections. One small box I have looked into is very much like a collection from England would be, or rather, I should say, from Europe; it contained *Pieris rapæ*, *P. mesentina*, *Colias chrysotheme*<sup>1</sup>, *Pieris daphidice*, *Lycæna cyllarus*, one pair of Nymphalidæ I don't know, *Detopeia pulchella*, and *Grammodes stolidæ*; I hope the others will show a greater variety. Mr. Murray's tour will extend over three months; and therefore his notes and his collection should be valuable; but I am afraid that he will not be able to get beyond Khelat i Gilgai.

"I send you a few notes made during the past year of what my

<sup>1</sup> By this is intended *C. erate*; some of the others, as *L. cyllarus*, are doubtless identified from memory.

collector has brought in from captures at this place (Kurrachee); it is of course only a very slight sketch. The life of a Chief Commissariat Officer at the base of war operations has not much leisure in it. I have had to keep the army of Southern Afghanistan supplied with pretty well every thing . . . It has therefore only been at odd hours, when every one else was sleeping, that I have been able to take occasional notes."

The second consignment consisted of a single small box forwarded on the 12th August, and followed by a letter dated from Quetta 3rd September, 1880, in which Major Swinhoe says:—"I rode up the Bolan 100 odd miles in five days. The heat at Sibi and at the first two stages was intense; but we began to ascend rapidly before reaching Mach, when we got out of the heat, and at Dusht, 6000 feet above sea-level, it was dreadfully cold at night, to me especially, just coming out of the intense heat of the Sind post. You descend again a thousand feet on reaching Quetta.

"I have, as usual, been collecting everywhere. I have my collector with me, who hunts every day; and after my day's work is done I sort the good out of the rubbish, and put them carefully away with the dates attached to the examples; and my friends returning sick or on duty to Kurrachee take them to my wife there, who knows how to take care of them until my return. I hope I shall have a nice report to make to the British Museum when I return, and send you a fine collection of examples; but indeed both in Birds and Butterflies there is not much new; most are European species"<sup>1</sup>.

The following is a list of the species:—

#### RHOPALOCERA.

##### NYMPHALIDÆ.

##### EUPLŒINÆ.

###### 1. EUPLŒA VERMICULATA (No. 1).

*Euplœa vermiculata*, Butler, P. Z. S. 1866, p. 276.

Mussoorie (one specimen).

Major Swinhoe says that the allied *E. core* is "taken at Hyderabad, Sind; said to be occasionally taken at Kurrachee—not found here by me:" he also applies the same observation to *Danais limniace*<sup>2</sup> and *Melanitis ismene*.

###### 2. PARANTICA NILGIRIENSIS (No. 2).

*Danais nilgiriensis*, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 44 (1877).

One female specimen. Neilgherries.

###### 3. PARANTICA AGLEA (No. 3).

*Papilio aglea*, Cramer, Pap. Exot. iv. pl. 377. f. E (1782).

One male from Belgaum.

<sup>1</sup> My report on Captain Roberts's collection has shown that the Lepidoptera are rather Persian than European species, although allied to European forms.

<sup>2</sup> *Tirumala limniace*, Moore.

## NYMPHALINÆ.

4. *HYPOLIMNAS MISIPPUS*.

*Papilio misippus*, Linnæus, Mus. Lud. Ulr. p. 291 (1764).

♂ Kurrachee (October, 1879); ♀ Kurrachee (July, 1880); ♀ Magar Pir, Sind. The females are both referable to the variety *H. dorippus* of Klug. Major Swinhoe remarks of this species:—"Common in September; many of the females show great variety in markings, some having the apical area very slightly marked with the usual black markings; common also in Hydrabad."

*H. bolina*, L., is stated to be in the Kurrachee Museum, as taken there.

Of the *Vanessæ* (which are not represented in the collection) Major Swinhoe forwards the following notes:—

"*Pyrameis cardui*, L., January, February, July, August, and December.

"*Junonia lemonias*, L., in Kurrachee Museum as taken here; *J. anone*, L., January to May, November and December, common; *J. orithyia*, L., April and May, not common; *J. asteria*, L., Hydrabad, Sind, one specimen taken at Kurrachee in N.W.; *J. almana*, L., January and November, not common."

5. *MODUZA PROCRI* (No. 1).

*Limenitis procris*, Cramer, Pap. Exot. ii. pl. 106. f. E, F (1779).

One example, but only labelled "N. India."

6. *RAHINDA HORDONIA* (No. 6).

*Papilio hordonia*, Stoll, Suppl. Cramer, pl. 33. f. 4, 4d (1790).

One example, Neilgherries.

7. *PARTHENOS VIRENS* (No. 1)<sup>1</sup>.

*Parthenos virens*, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 47 (1877).

Two specimens, Neilgherries.

8. *CIRROCHROA SWINHOEI*, sp. n. (No. 3).

♀. Allied to *C. thais* of Ceylon, but of a clear bright fulvous colour above, almost as bright as in *C. aoris* and *C. mithila*, the primaries more falcate than in *C. thais*, the inner or discal zigzag line less strongly defined and more completely separated into <-shaped markings, the very irregular series just beyond the cell considerably more slender, secondaries with all the markings less pronounced: body considerably paler, the thorax pale greenish. Under surface stone-colour, with greenish and flesh-coloured tints, the basal area to the middle being flesh-coloured, the discal lines and outer borders washed with pale olivaceous; the band across the centre rather paler than the ground-colour, but not white or silvery in the type specimen; a diffused double pearly white spot at apex of primaries;

<sup>1</sup> "Cynthia No. 1," on label.



pectus whitish, legs flesh-coloured. Expanse of wings 2 inches 7 lines.

One specimen. Neilgherries. Mr. Moore has examples, apparently referable to this species, in his collection from the Neilgherries.

9. *MESSARAS ERYMANTHIS* (No. 2).

*Papilio erymanthis*, Drury, Ill. Exot. Ent. i. pl. 15. figs. 3, 4 (1773).

One specimen. Neilgherries.

10. *HYPANIS POLINICE* (No. 5).

*Papilio polinice*, Cramer, Pap. Exot. iv. pl. 375. f. G, H (1782)

One specimen. Neilgherries.

11. *MELITÆA ROBERTSII* (No. 7).

*Melitæa robertsii*, Butler, P. Z. S. 1880, p. 406, pl. 39. fig. 2.

One specimen. Chaman, South Afghanistan, May 1880.

MORPHINÆ.

12. *DISCOPHORA TULLIA* (No. 4).

*Papilio tullia*, Cramer, Pap. Exot. i. pl. 81. f. A, B (1779).

One female specimen. "North India."

LYCÆNIDÆ.

13. *CURETIS PHÆDRUS* (No. 2).

*Papilio phædrus*, Fabricius, Sp. Ins. ii. p. 125 (1781).

One female. Neilgherries.

14. *POLYOMMATUS BÆTICUS*.

*Papilio bæticus*, Linnæus, Syst. Nat. i. (2) p. 789 (1766).

Seven specimens. Kurrachee, May and June, 1879.

Major Swinhoe says that this species is very common in January, April, May, and July.

15. *CATOCHRYSOPS CNEJUS*.

*Hesperia cnejus*, Fabricius, Ent. Syst. Suppl. p. 430 (1798).

Two males. Kurrachee, October 1879.

With this species were two smaller *Lycænæ* which agree fairly well with *C. contracta*, and must I think be slight variations of that species; but Major Swinhoe seems to regard them as a seasonal variety of *L. cnejus*. He says:—"The September brood taken here, at the Hubb river, and in the Mulleer, all within a radius of 20 miles from Kurrachee, is more than double the size of those taken in the spring and summer—the former having an expanse of  $1\frac{1}{4}$  inch, while the others are barely 10 lines, the difference every way in size being quite remarkable, whereas in every other respect the examples are identical."

Of the four specimens now sent as *C. cnejus*, two are typical and

belong to the large type taken in September; the two others are very like *L. contracta*, are altogether bluer above than *L. cnejus*, and have the discal row of white-zoned black spots on the primaries below interrupted.

16. *CATOCHRYSOPS CONTRACTA* ?

*Lampides contracta*, Butler, P. Z. S. 1880, p. 406, pl. 39. fig. 3.  
Two specimens (as *L. cnejus*). Kurrachee, June 1879.

17. *CATOCHRYSOPS ELLA*, sp. n. (No. 6).

Allied to *C. cnejus*, but with the coloration of the wings below more like *C. pandava*. Wings above lilac, greenish at the base, the male with a broad dark brown border twice as wide at apex as towards the external angle; the female with a blackish marginal line and indistinct ocelloid submarginal spots: secondaries with a black marginal line and a submarginal series of six ocelloid spots, less distinct in the male than in the female, the first indistinct in both sexes, the three following brown with white borders, the fifth large, black, with the border white externally and orange internally, anal spot bifid, black with white border; fringe white, tail black tipped with white. Wings below brownish grey, with the spots arranged as in *C. cnejus*, but broader, less prominent; the submarginal spots relieved internally by a rather broad brown border, beyond which is a diffused discal white streak or band; the black ocelli towards the anal angle vary in intensity, and sometimes are almost wholly lost, as in the male before me. Expanse of wings, ♂ 10 lines, ♀ 1 inch.

A pair, rather worn. Kurrachee. ♂, December 1879; ♀, January 1880.

There are specimens of this species in Mr. Moore's collection. Major Swinhoe says that it is not common.

18. *LAMPIDES ÆLIANUS* (No. 7).

*Hesperia alianus*, Fabricius, Ent. Syst. iii. 1, p. 280 (1793).  
One male. Neilgherries.

19. *TARUCUS PLINIUS* (No. 1).

*Hesperia plinius*, Fabricius, Ent. Syst. iii. 1, p. 284 (1793).  
Two examples. Kurrachee, May and June, 1879. Also occurs in July, and is common.

20. *TARUCUS NARA*.

*Lycæna nara*, Kollar, Hügel's Kaschmir, iv. 2, p. 421 (1848).  
Four specimens. Kurrachee, May and October, 1879.  
*T. nara* is said to be common from April to August, and in November.

21. *LYCÆNA FUGITIVA*, n. sp.

Intermediate in character between *L. persica* and *zephyrus*, but nearer to the latter. Wings of the male above bright lilacine blue,

with a black marginal line, fringe with the basal half grey, the external half white; of the female smoky brown, more or less washed with blue towards the base, a submarginal series of small lunate orange spots, outer border broadly blackish, fringe as in the male. Wings below whitish-brown, greyer and paler in the male than in the female; the black spots arranged exactly as in *L. zephyrus*, but all smaller and with less conspicuously white zones; the double series of submarginal spots on the primaries grey and without connecting orange spots in the male, paler in the female; submarginal spots on the secondaries less distinctly black, the orange spots paler, not relieved by a pure white border as in *L. zephyrus*; base of the secondaries rather more broadly washed with bluish green. Expanse of wings 1 inch  $1\frac{1}{2}$  line.

Three pairs, the females much worn. Quetta, North Beloochistan, March and April.

This is incorrectly labelled *L. cyllarus*?; the latter is a much larger and very distinct species.

22. *ZIZERA KARSANDRA* (Nos. 4 & 5).

*Polyommatus karsandra*, Moore, P. Z. S. 1865, p. 505. n. 106, pl. 31. fig. 7.

Sixteen specimens, but mostly worn or broken. "April, May, July; very common. Kurrachee."

23. *SCOLITANTIDES NYSEUS* (No. 8).

*Polyommatus nyseus*, Guérin in Deless. Souv. Voy. Ind. p. 78, pl. 22. fig. 1 (1843).

One fair specimen, Hyderabad, Sind; and one broken, Neilgherries.

24. *APHNÆUS ACAMAS*.

*Lycaena acamas*, Klug, Symb. Phys. pl. 40. figs. 7-9 (1834).

A pair in good condition. Kurrachee, February and August, 1880. Occurs at "Hydrabad, Sind, in February, March, and August, but is not common."

25. *APHNÆUS VULCANUS*, var. (No. 2).

*Papilio vulcanus*, Fabricius, Syst. Ent. p. 519 (1775).

One worn female. Neilgherries.

PAPILIONIDÆ.

PIERINÆ.

26. *COLIAS NILGIRIENSIS*.

*Colias nilagiriensis*, Felder, Wien. ent. Mon. iii. p. 395 (1859).

Two pairs. Neilgherries.

27. *COLIAS ERATE*.

*Papilio erate*, Esper, Eur. Schmett. i. (2) pl. 119. fig. 3 (1806).

One worn pair. Quetta, 26th March and 20th April, 1880.

These specimens are rather smaller than European examples, and may possibly represent a dwarfed race of the species.

28. *TERIAS HECABEOIDES*.

*Terias hecabeoides*, Ménétriés, Cat. Mus. Petrop. Lep. i. p. 85, pl. 2. fig. 2 (1855).

Two females. Kurrachee, June and July 1879.

"Very common in April, June, July, and August."

29. *TERIAS ÆSIOPE* (No. 2).

*Terias æsiope*, Ménétriés, Cat. Mus. Petrop. Lep. i. p. 85, pl. 2. fig. 3 (1855).

One male. Calcutta. "January, rare."

30. *TERIAS LÆTA* (No. 1).

*Terias læta*, Boisduval, Sp. Gén. Léop. i. p. 694 (1836).

One female. Belgium.

Major Swinhoe says that *T. venata* occurs rarely at Kurrachee in August.

31. *TERACOLUS VESTALIS*.

*Teracolus vestalis*, Butler, P. Z. S. 1876, p. 135. n. 32, pl. 7. fig. 10.

Nine good specimens. Kurrachee, May 1879.

Major Swinhoe notes the following months in which this species may be taken—January to May, August, September, November, and December. This, however, is somewhat modified by subsequent remarks respecting this species and *T. puellaris*.

32. *TERACOLUS PUELLARIS*.

*Teracolus puellaris*, Butler, P. Z. S. 1876, p. 136, n. 33.

Ten specimens, mostly good. April and May, 1879.

Major Swinhoe says:—"The great distinction between the two above species, I take it, is the colouring of the underside, *puellaris* being yellow, and *vestalis* having a pinkish orange tinge, especially in the marginal border of the primaries and throughout the secondaries; but there appear to be two kinds distinct from *vestalis*, both of which I think are not *puellaris*, the black border on the upperside of the secondaries being twice as broad in the one as in the other; and as there are both sexes of each kind, I think they are distinct. I send you a series of 25 examples, 9 being the ordinary *vestalis*, 10 *vestalis* of a smaller size which are marked "*Idmais* No. 1" in my collection, and 6 marked "No. 2," which are like *puellaris*, except for the very narrow border on the secondaries; kindly tell me if these are *puellaris* or another species. I don't send you any more typical *puellaris*; you have plenty in the Museum collection, and they are rare here; and I have but four examples, one of these, by the way, being a monster, very darkly and strongly marked throughout with black, with many large dark spots on the underside of the secondaries."

As there appears to be some little confusion respecting these white species of *Teracolus*, I may briefly diagnose them as follows:—

*T. vestalis* expands 20–24 lines; border of secondaries above broad in both sexes; wings below sulphur-yellow, *the apex of primaries and entire surface of secondaries in the female occasionally irrorated with grey and washed with mustard-yellow*, the secondaries also frequently with an oblique discal series of olive-brown spots. May.

*T. puellaris* expands 17–21 lines; border of secondaries above varying in width<sup>1</sup>; female often pale yellow above; male below usually of a brighter yellow than *T. vestalis*, and with narrower black discal spots; *the apex of primaries and entire surface of secondaries in the female below flesh-coloured*; the outer border of secondaries darker, and limited by a complete angular discal series of brownish spots. April and May.

*T. ochreipennis* expands 16 to 20½ lines; border of secondaries above rather broad in both sexes; both male and female white above in all specimens which I have seen; *the apex of primaries and entire surface of secondaries in both sexes below ochraceous*, the secondaries with rather darker border, limited internally by two or three brownish spots, which sometimes, however, are obsolete. November.

### 33. TERACOLUS OCHREIPENNIS (No. 2).

*Teracolus ochreipennis*, Butler, P. Z. S. p. 136. n. 34 (1876).

Six specimens, in tolerably good condition. Kurrachee, November 1879.

### 34. TERACOLUS DYNAMENE.

*Pontia dynamene*, Klug, Symb. Phys. pl. vi. figs. 17, 18 (1829).

Four specimens. Kurrachee, May 1879.

“Very common. May, November, December.”—*C. S.*

Of *T. protractus* Major Swinhoe says:—“January, March, August, November, not common; very common in Hyderabad and on the Hubb river.”

Of *T. solaris* (of which we only possess one specimen, a male) he says:—“January, August, December, common.”

### 35. TERACOLUS ETRIDA (No. 1).

*Anthocharis etrida*, Boisduval, Sp. Gén. Léop. i. p. 576 (1836).

Three typical males and one typical female. Kurrachee, May and June 1879.

*Var.* Orange apical patch wider in both sexes, its inner black-brown boundary becoming obsolete towards the costal border in the male.

Three males and two females. Kurrachee, May and June 1879.

This variety resembles *T. purus* in the pattern of the apex of primaries.

<sup>1</sup> Always narrow in Kurrachee males.

36. *TERACOLUS PURUS* (Nos. 3 & 4).

*Teracolus purus*, Butler, P. Z. S. 1876, p. 160. n. 113, pl. 7. figs. 14, 15.

Four males and two females. Kurrachee, May and June 1879.

Four of the specimens, including the females, are labelled "3;" the other two, males, are labelled "4." The following species (if indeed it be distinct, which I begin to doubt) is similarly mixed up, one male and two females being labelled "3," and two males "4."

37. *TERACOLUS BIMBURA* (Nos. 3 & 4).

*Teracolus bimbura*, Butler, P. Z. S. 1876, p. 161. n. 117, pl. 7. figs. 3, 4.

Three males and two females. Kurrachee, May 1879.

This form differs from *T. purus* in the narrower blackish borders to the apical orange patch in both sexes, the smaller marginal spots on the secondaries, the usually slightly inferior size; the difference of irroration on the under surface of the secondaries seems to be confined to specimens taken in Cashmere; but my figures of the upper surface accurately represent *T. bimbura* of Kurrachee. My figure of *T. purus* ♀ doubtless represents the female of *T. etrida*, which, when I wrote my "Revision" of the genus, was a rare species in collections, and consequently not readily recognized by me. The true female of *T. purus* is of about the same size as the male, and has a more curved orange patch on the apical area; the marginal spots on the secondaries are also rather smaller than in *T. etrida* ♀; and the spots across the disk of these wings on the under surface are less conspicuous.

38. *TERACOLUS DIRUS* (Nos. 1 & 2).

*Teracolus dirus*, Butler, P. Z. S. 1876, p. 157. n. 108, pl. 7. figs. 11 & 13, ♀.

One male and two females. Kurrachee, May and June, 1879.

This species is also said to occur in July and August. It is easily separable from *T. dulcis* by the much broader and darker grey patch at the base of *all* the wings, by the larger marginal black spots on the male, and the presence of an additional series of discal black spots on the disk of the secondaries on the female—a character wholly failing in Kurrachee females of *T. dulcis*, and never represented elsewhere excepting by one or two indistinct spots: the under surface of the female secondaries also inclines to yellow in tint, whereas in *T. dulcis* it is quite pink.

39. *TERACOLUS DULCIS* (Nos. 1 & 2).

*Teracolus dulcis*, Butler, P. Z. S. 1876, p. 157. n. 107, pl. 7. fig. 13 ♂.

Three males and two females. May and June 1879.

Major Swinhoe gives the following months for the appearance of this species:—"January, August, and November." It is possible, however, that he may have confounded it in life with the preceding

species (as he has done in death), since it is hardly probable that the same species would be taken for eight months in succession. It is no wonder that any one, however much experienced in the study of the Lepidoptera generally, should confound the species of such difficult genera as *Teracolus*, *Colias*, and *Terias*; only special study can educate one readily to recognize the differences between many of them: doubtless a tendency to hybridization between allied species does not assist one in identifying them.

#### 40. CATOPSILIA THISORELLA.

*Callidryas thisorella*, Boisduval, Sp. Gén. Lép. i. p. 609 (1836).

Two males. Kurrachee, May 1879.

Whether this race of *C. pyranthe* is constant to Kurrachee I have no means of judging. Major Swinhoe gives March, May, and December as its times of appearance, and says that it is common.

#### 41. APPIAS DARADA (No. 2).

*Pieris darada*, Felder, Reise der Nov. Lep. p. 166, n. 142 (1867).

One male. Neilgherries.

"One specimen, taken at Kurrachee; month not recorded.—*C. S.*

#### 42. APPIAS NARENDRA (No. 3).

*Appias narendra*, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 48 (1877).

One male. Neilgherries.

The female is at present unknown to us; but Major Swinhoe speaks of the probable female as "smaller, with broader marginal black band on the upper surface of the secondaries, and the under surface of these wings nearly white." It would be quite unusual for the female to be smaller than the male; but this might be merely an individual character.

#### 43. PAPILIO MESENTINA.

*Papilio mesentina*, Cramer, Pap. Exot. iii. pl. 270. f. A, B (1782).

A pair. Quetta, North Beloochistan, March 1880.

Occurs very commonly from February to May, and in November and December.

#### 44. SYNCHLOË DAPLIDICE.

*Papilio daplidice*, Linnæus, Syst. Nat. (1) ii. p. 760 (1766).

A pair. Quetta, April 7th & 15th, 1880.

#### 45. GANORIS GLICIRIA (No. 1).

*Papilio gliciria*, Cramer, Pap. Exot. ii. pl. 171. f. E, F (1779).

A pair. Neilgherries.

46. *GANORIS MANNII*.

*Pontia mannii*, Mayer, Stett. ent. Zeit. 1851, p. 151.

One specimen, Quetta, 26th March; two at Chaman, S. Afghanistan, in May 1880.

This looks much like a well-marked variety of the following species.

47. *GANORIS RAPÆ*.

*Papilio rapæ*, Linnæus, Faun. Suec. p. 270, n. 1936 (1761).

One specimen, Quetta, 26th March; one at Chaman, May 1880.

48. *NEPHERONIA PINGASA* (No. 1).

*Eronia pingasa*, Moore, P. Z. S. 1872, p. 365.

One male. Neilgherries.

The specimen sent belongs to the variety in which the upper surface exactly resembles *N. valeria* ♂; and the under surface shows traces of the submarginal spots, which in the female limit the outer border. The species belongs to the *N. valeria* group, the females of which (unlike that of *N. hippia*) show no trace of yellow on the secondaries.

## PAPILIONINÆ.

49. *PAPILIO BUDDHA* (No. 3).

*Papilio buddha*, Westwood, Trans. Ent. Soc. 1872, p. 86, pl. 3. fig. 1.

One damaged specimen of this rare species. Neilgherries.

*P. erithonius* is said to be common at Kurrachee from January to March, August and December; and *P. diphilus* very common in August only.

## HESPERIIDÆ.

50. *PAMPHILA MATHIAS*.

*Hesperia mathias*, Fabricius, Ent. Syst. Suppl. p. 433 (1798).

One male. Kurrachee, June 1879.

"Very common in February, April, May, July, September, and November," according to Major Swinhoe; but it is probable that the following species is included in this statement.

51. *PAMPHILA KARSANA*.

*Hesperia karsana*, Moore, P. Z. S. 1874, p. 576, pl. 67. fig. 6.

One male. Kurrachee, May 1879.

The small size, golden brown coloration, and absence of hyaline spots readily distinguish this from *P. mathias*.

52. *PYRGUS EVANIDUS*.

*Pyrgus evanidus*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 223.

Nine specimens. Kurrachee,



The following times of appearance are given—January to March, June, August, and September; but the following species was mixed up with the specimens of *P. evanidus*.

### 53. PYRGUS GALBA.

*Hesperia galba*, Fabricius, Ent. Syst. iii. (1) p. 352 (1793).

Eight specimens. Kurrachee.

The unbroken creamy white band across the centre of the secondaries on the under surface readily separates this species from the preceding, as also the straighter and continuous subbasal white line; as a rule, but not invariably, the under surface of *P. galba* is darker.

## HETEROCERA.

### SPHINGIDÆ.

### 54. CHÆROCAMPA NESSUS (No. 1).

*Sphinx nesus*, Drury, Ill. Exot. Ent. ii. p. 46, pl. 27. fig. 1 (1773).

One specimen. Belgaum.

"One specimen taken in October" (*C. S.*). Of other species found at Kurrachee are mentioned:—*C. celerio*, rarely in November and December; *C. elpenor* (probably *C. fraterna*), one specimen, probably taken in December, but the month not recorded at the time; and *C. oldenlandiæ*, one specimen in December; *Deilephila livornica*, one specimen taken in March.

### 55. PERGESA ACTEUS (No. 2).

*Sphinx acteus*, Cramer, Pap. Exot. iii. pl. 248, A (1782):

One specimen. Belgaum.

The only other species of the family noted by Major Swinhoe are:—*Cephonodes hylas*, one specimen of which was taken at Kurrachee in December; *Daphnis nerii*, taken from March to May; and *Acherontia morta*, which is common in July and August.

Respecting *D. nerii*, Major Swinhoe says:—"There appear to be three broods here, one after the other. I have taken caterpillars full-grown in all three months on the oleander which abounds everywhere in these parts: the caterpillars eat the flower only of the double garden oleander, and the leaves only of the wild single oleander. How this is I can't explain; but it is a fact I have carefully observed both in the jungles and the gardens here and when rearing them in my house. They are emerald-green at first, then turn dull yellow, and finally black before they leave off feeding; they burrow a few inches into the earth at the roots of the oleander, make a smooth cell, spin a very little silk, and the moth emerges in from 16 to 20 days. Out of 5 caterpillars in my breeding-cage, 3 became moths in 16 days after the chrysalis was formed and 2 in 20 days, there being one male in both instances."

## AGARISTIDÆ.

—56. *ÆGOCERA VENULIA* (No. 40).

*Phalæna venulia*, Cramer, Pap. Exot. ii. pl. 165. f. D (1779).

One specimen. Neilgherries.

The Western form of this species differs from the Eastern in the greater length of the longitudinal white streak beyond the second black spot on the primaries.

## ARCTIIDÆ.

—57. *ALOA EMITTENS* (No. 2<sup>1</sup>).

*Cretonotos emittens*, Walker, Cat. Lep. Het. iii. p. 638 (1855).

One specimen. Belgaum.

## LITHOSIIDÆ.

—58. *DEIOPEIA THYTER*.

*Deiopeia thyter*, Butler, Trans. Ent. Soc. 1877, p. 361.

One specimen. Kurrachee, October 1879.

*D. pulchella* is said to be common in Kurrachee from January to March and in May and December.

## NYCTEMERIDÆ.

—59. *NYCTEMERA LACTICINIA* (No. 42).

*Phalæna lacticina*, Cramer, Pap. Exot. ii. pl. 128. f. E (1779).

One specimen. Belgaum.

## NYCTEOLIDÆ.

—60. *EARIAS TRISTRIGOSA*, sp. n. (Nos. 20 & 26).

Nearly allied to *E. frondosana*, from which it chiefly differs in the absence of the brown border to the secondaries; primaries pea-green, with diffused whitish costal border, three darker green parallel angulated oblique stripes from the inner margin to near the costal margin, external border also darker green; secondaries semi-transparent pearly white, slightly golden along the outer margin; thorax green; abdomen creamy yellowish. Primaries below pale greenish white, sericeous; secondaries as above, the costal border creamy; body below white. Expanse of wings  $9\frac{1}{2}$  to  $10\frac{1}{2}$  lines.

Two specimens. Hubb river, Beloochistan, February 1879; one (faded), Kurrachee, April 1879.

We have this species from the Punjaub.

## ENNOMIDÆ.

—61. *HYPERYTHRA SWINHOEI*.

*Hyperythra swinhoei*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 223 (1880).

Two males. Kurrachee, November 1879.

<sup>1</sup> "*Rhyparia* No. 2" (C. S.).

-62. *HYPERYTHRA PHANTASMA*, sp. n. (No. 35).

Sordid creamy whitish or very pale stone-colour; wings sparsely speckled with grey and crossed by three equidistant olivaceous slightly arched lines, basal area to the second line slightly obscured, external area from the third line to the margin washed with olivaceous greenish; tegulæ and abdomen slightly darker than the rest of the body. Wings below cream-colour, the external area slightly darker and limited by a grey line representing the third line of the upper surface; body brownish white. Expanse of wings 1 inch 6 lines.

One female. Kurrachee, February 1880.

Said to be rare. It is hardly likely to be the female of *H. swinhoei*, the latter being taken in November and having a more typical style of coloration with less regular lines across the wings. *H. phantasma* is an unusually colourless species, the under surface (which is usually far more brilliant than the upper surface) being almost uniformly creamy whitish.

## GEOMETRIDÆ.

-*LOXOCHILA*, gen. nov.

Allied to *Tanaorhinus* and *Geometra*. From the former it differs in its more perfectly pectinated male antennæ, its shorter palpi, less falcate primaries, and in the second and third median branches of these wings being emitted at the same point from the inferior angle of the cell; from the latter in its shorter palpi, the shorter discoidal cell of the primaries, and the simultaneous emission of the median branches noted above; the male antennæ are scarcely so fully pectinated as in *Geometra*, as the apex remains bare. Type *L. smaragdus* (*Tanaorhinus smaragdus*, Butl.).

-63. *LOXOCHILA MUTANS*, sp. n. (No. 28).

Wings above pale sandy buff, probably dull sea-green when fresh (showing traces of this colour in some specimens), crossed in the middle from second third of costal margin of primaries to just beyond the middle of the abdominal margin of secondaries by a white line bordered internally by a line darker than the ground-colour; primaries with a second divergent transverse white line across the basal third; fringe of all the wings white; thorax of the same colour as the primaries; abdomen white; crest of head white; antennæ sandy yellowish. Under surface white, the costal borders of the wings, apical area of primaries, and a tint on the pectus and legs sandy buff, probably green in fresh specimens. Expanse of wings 1 inch 8-10 lines.

One specimen. Neilgherries.

In addition to the example sent by Major Swinhoe (which shows no trace of the original green coloration), we have three specimens formerly in the collection of Mr. Norris<sup>1</sup>, which show distinct

<sup>1</sup> Some of the species in this collection were described by Walker; and the types of the Indian forms were purchased by Mr. Moore.

traces of green colouring similar to that of *Thalera thymiaris* of Europe. The only locality given is "N. India"! but there can be little doubt that they were all obtained in the Neilgherries; "N. India" seems to represent any thing, in some collections, from Scinde to Madras.

The genus *Litbada* of Walker appears to be allied to *Loxochila* and *Geometra*; but its brownish colouring seems to be permanent.

—64. *NEMORIA PRUINOSA* (No. 2).

*Nemoria pruinosa*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 224. n. 19 (1880).

Two specimens. Kurrachee, September 1879.

"January, September, and December, not common."—C. S.

—65. *NEMORIA FREQUENS*, sp. n. (No. 34).

Wings above sap-green, minutely reticulated with silvery white, fringe cream-coloured; palpi whitish, rose-red towards the tips; frons brown; crest and antennæ white; body above white; wings below silky white, slightly tinted with green towards the margins; body below silky cream-colour; front legs above slightly pink. Expanse of wings 11 lines.

One specimen. Kurrachee, March 1880.

Said to be common in April and November.

#### ACIDALIIDÆ.

—66. *ACIDALIA DISTRACTA*, sp. n. (No. 30).

Sandy whitish, densely irrorated with black, wings crossed in the middle by a very irregular dusky band formed by black scales on a testaceous ground, and having the appearance of two approximated lines; this band is almost divided (leaving only a slender line) upon the median interspaces of the primaries, and does not reach the costal margin of the secondaries; an indistinct dentate sinuate dusky discal line spotted upon the veins with black; a dusky undulated disco-submarginal band, interrupted in all the wings upon the radial and interno-median interspaces; a marginal black line interrupted at the extremities of all the veins; fringe white, speckled with black; primaries with an additional curved interrupted dusky band across the basal third; a dusky discoidal stigma; secondaries with a black discoidal stigma: under surface sericeous creamy white. Expanse of wings 1 inch.

Three specimens. Kurrachee, February 1879, May 1880. "January to March and May, common."—C. S.

#### MACARIIDÆ.

—67. *MACARIA MYANDARIA* (No. 33).

*Macaria myandaria*, Walker, Cat. Lep. Het. xxvi. p. 1649 (1852).

One specimen, Matheran, May 1879.

## FIDONIIDÆ.

- 68. STERRHA SACRARIA (No. 31).

*Phalena sacraria*, Linnæus, Syst. Nat. i. (2) p. 863 (1766).

One specimen. Kurrachee, September 1879.

Said to be taken rarely in November.

## LARENTIIDÆ.

- 69. LARENTIA FISSIFERATA, var. ? (No. 32).

*Larentia fissiferata*, Walker, Cat. Lep. Het. xxiv. p. 1194 (1862).

Two specimens. Neilgherries.

This species is allied to *L. didymata* of Europe.

- 70. SCOTOSIA DUBIOSATA (No. 29).

*Scotosia dubiosata*, Walker, Cat. Lép. Het. xxv. p. 1352 (1862).

One specimen. Neilgherries.

## LEUCANIIDÆ.

- 71. LEUCANIA LOREYI (No. 1
- <sup>1</sup>
- ).

*Noctua loreyi*, Duponchel, Hist. Nat. Lép. Fr. iv. p. 81, pl. 105. fig. 7 (1827).

One specimen. Kurrachee, April 1880. "February and April, rare."—C. S.

## XYLOPHASIIDÆ.

- 72. SPODOPTERA CILIUM (No. 43).

*Spodoptera cilium*, Guénée, Noct. i. p. 154 (1852).

One specimen. Sajee, Southern Afghanistan, May 1880.

## CARADRINIDÆ.

- 73. AMYNA CEPHUSALIS (No. 46).

*Ilattia cephusalis*, Walker, Cat. Lep. Het. xvi. p. 209 (1858).

One specimen, Kurrachee, July 1880.

## NOCTUIDÆ.

- 74. SPÆLOTIS UNDULANS ? (No. 38).

*Spælotis undulans*, Moore, Sci. Res. Yark. Miss., Lep. pl. i. fig 10 (1879).

One specimen. Kurrachee, July 1880.

This example agrees in every respect with Moore's figure; the only cause for doubt is that the range seems somewhat extensive.

- 75. CHERSOTIS QUADRISIGNA (No. 6).

*Agrotis quadrisigna*, Moore, P. Z. S. 1881.

One broken example. Neilgherries.

This species is allied to *C. rectangula* of Europe.

<sup>1</sup> "*Prodenia* No. 1" on label.

## ORTHOSIIDÆ.

-76. *ORTHOSIA ERUBESCENS*.

*Orthosia erubescens*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 224 (1880).

One specimen. Neilgherries.

## HADENIDÆ.

-77. *HADENA AURIPLANA* (No. 1<sup>1</sup>).

*Eurois? auriplana*, Walker, Cat. Lep. Het. xi. p. 557 (1857).

One specimen. Neilgherries.

-78. *ANARTA? GEMMIFERA* (No. 3<sup>2</sup>).

*Plusia gemmifera*, Walker, Cat. Lep. Het. xii. p. 934 (1857).

One specimen. Neilgherries.

This appears to me to agree far better with *Anarta* than with any other genus known to me.

## ANTHOPHILIDÆ.

-79. *ACANTHOLIPES AFFINIS*.

*Docela affinis*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. v. p. 225 (1880).

Three specimens. Kurrachee, April and May, 1880.

Also occurs in February, November, and December.

It will be seen by reference to my description that I called attention to the similarity of *Docela* to *Microphysa* (= *Acantholipes*), but stated at the same time that the palpi were longer and thicker. This I still think to be the case; but as Mr. Moore considers the two genera identical, I have no wish to retain Walker's appellation.

## PLUSIIDÆ.

-80. *PLUSIA VERTICILLATA* (No. 1).

*Plusia verticillata*, Guénée, Noct. ii. p. 344 (1852).

Two specimens. Kurrachee, November 1879.

This species is said also to be common in February, March, and May. Major Swinhoe says he has a specimen in which the ground-colour is quite black, and another with a deep reddish tinge. He also mentions *Abrostola subapicalis* as taken at Kurrachee in November, and *Xanthiodes intersepta* as common in October and November.

## HOMOPTERIDÆ.

-81. *HOMOPTERA VETUSTA* (No. 36).

*Polydesma vetusta*, Walker, Cat. Lep. Het. Suppl. iii. p. 875 (1865).

One specimen. Kurrachee, May 1880.

<sup>1</sup> "*Xylophasia* No. 1." <sup>2</sup> "*Hadena* No. 3."

## HYPOGRAMMIDÆ.

—82. RHIZOGRAMMA INEXTRICATA (No. 1<sup>1</sup>).

*Rhizogramma inextricata*, Moore, P. Z. S. 1881, p. 342.

One example. Neilgherries.

This insect seems to me to come nearest to the genus *Gadirtha*.

## —83. SELEPA DOCILIS, sp. n. (No. 21).

Primaries above silver-grey, the basal area irregularly spotted with blackish and limited by two irregularly dentate-sinuate-arched parallel blackish lines; a black dot with white margin at the end of the cell, followed by two arched parallel blackish lines, which form an inangulated elbow at the first median branch; beyond these lines is an arched series of abbreviated longitudinal black dashes, followed by an alternated marginal series of similar dashes; a marginal black spot at the extremity of the first median branch: secondaries silvery white with slight golden reflections: thorax grey; abdomen white. Wings below silvery white, the secondaries with pearly reflections; body below white. Expanse of wings 10 lines.

*Var.* Markings of primaries obsolete, with the exception of the outer discal line; the submarginal black dashes replaced by a slightly irregular greyish testaceous stripe. Expanse of wings 9½ lines.

Two specimens. Kurrachee, May 1879.

Also said to be common in November and December.

I am rather uncertain about the right position of the genus *Selepa*; but its palpi are rather similar to those of *Gadirtha*; it also seems nearly allied to *Egelesta*, *Plotheia*, and *Girbatha* of Walker. The type species was, I believe, inadvertently referred by its author to the Limacodidæ; but from this family the structure of the body at once distinguishes it.

## OPHIDERIDÆ.

## —84. OPHIDERES HYPERMNESTRA (No. 2).

*Phalæna hypermnestra*, Cramer, Pap. Exot. iv. pl. 323. f. A, B (1782).

Two specimens. Belgaum.

## OMMATOPHORIDÆ.

## —85. ARGIVA HIEROGLYPHICA, var. ULULA (No. 1).

*Noctua ulula*, Fabricius, Sp. Ins. ii. p. 211 (1781).

One specimen. Belgaum.

## OPHIUSIDÆ.

## —86. THRIA FUGITIVA.

*Cerbia fugitiva*, Walker, Cat. Lep. Het. xiv. p. 1365 (1857).

One specimen. Kurrachee, May 1879.

The genus *Cerbia* must sink as a synonym of *Thria*, established at p. iv of the same volume; indeed I am doubtful whether even

<sup>1</sup> Labelled as a *Cucullia*, which it resembles except in its long palpi.

the species is not identical with *T. robusta*. As, however, the latter comes from South Africa, and is less heavily marked and paler than the Indian specimens in the collection of the British Museum, I hesitate to regard the two forms as conspecific.

87. *THRIA*? *INEPTA*, sp. n. (No. 44).

Primaries above with the basal three fifths sordid white, crossed near the base, and again at basal third, by irregular testaceous bands, the inner one with black internal and brown external margin, the outer one with brown internal and black external margin; a black costal dash between these bands; an oblique brownish patch, bisinuated in front, from the costa across the end of the cell, and beyond this a black costal dot; external three fifths greyish white, limited internally by a biangulated testaceous band having a black internal and brown external margin; disk crossed by a broadly dentate sinuate white line with testaceous outer border, and with its sinuations (on the inside) filled in with brown; a dark brown apical spot; a slender marginal blackish line, dotted with black between the veins; fringe white, sordid externally, and traversed by a dusky sinuated line: secondaries white, with brownish abdominal area; median vein to the commencement of the branches and the external two fifths of the wing black-brown; an oblique marginal spot near the anal angle and the fringe white: body above sordid white. Wings below white: primaries crossed from the inner margin beyond the middle almost to the costa by two divergent brown bands, the outer one diffused, emitting longitudinal streaks outwards along the veins and joining a large black costal spot; a black spot at apex; fringe brownish at the tips: secondaries with brown external area as above, but slightly paler, a large black spot at about the middle of the margin, bounded inwardly by the subanal marginal white spot: body below white, venter creamy. Expanse of wings 1 inch 7 lines.

One broken example, Chaman, Southern Afghanistan, May 1880.

EUCLIDIIDÆ.

88. *TRIGONODES* *HYPPASIA*.

*Phalaena hyppasia*, Cramer, Pap. Exot. iii. pl. 250. f. E (1782).

Three specimens. Kurrachee, July and October, 1879. Also said to be common in January, June, and September.

REMIGIIDÆ.

89. *GIRPA* *OPTATURA* (No. 2<sup>1</sup>).

*Remigia opatura*, Walker, Cat. Lep. Het. xv. p. 1848 (1858).

One specimen. Neilgherries.

HERMINIIDÆ.

90. *RIVULA* *SERICICALIS* (No. 24).

*Pyralis sericealis*, Denis, Wien. Verz. p. 122, n. 18.

Five specimens. Kurrachee, May 1879.

<sup>1</sup> "*Azacia* No. 2" on label.



"Very common in February, March, May, July, August, September, and November."—*C. S.*

*PYRALIDÆ.*

—91. *STEMMATOPHORA INGRATA*, sp. n.

Primaries above whitey brown; two white-bordered black dots placed transversely above one another at basal fourth; an irregularly falciform line beginning at about the middle of the inner margin, running obliquely upwards to the median vein, and then abruptly elbowed and sweeping outwards in a semicircle to the costal margin at apical sixth, white with brown internal border; secondaries white, apical border brownish; thorax whitey brown, abdomen white: under surface pure silky white. Expanse of wings  $6\frac{1}{2}$  lines.

Two rubbed specimens. Kurrachee, May 1880.

—92. *HYPOTIA VULGARIS*, sp. n. (No. 17).

Greyish brown: primaries above with a large patch of whitey brown occupying nearly the whole of the basal third, which is limited externally by a dusky-bordered zigzag white stripe; a white spot, bounded on each side by a blackish dot, within the end of the cell; a dusky-bordered white zigzag band immediately beyond the cell, varied with pale buff or whitey brown, speckled with grey, and diffused above the second median branch; a submarginal whitish dash across the third median and lower radial interspaces, and an oblique costal white dash close to apex; a marginal series of white-edged blackish points; fringe alternately greyish brown and white; in some specimens nearly the whole surface of the primaries is pale buff, only the area between the white bands being streaked or clouded with greyish brown, the inner white stripe or band being less zigzag, the marginal line wholly white, and the fringe spotted at the base with blackish (this would seem to be the more typical male form): secondaries sericeous, with diffused dusky border, usually with a submarginal series of white spots; fringe sordid white at base, pure white at tips, and traversed by two grey lines: thorax whitish. Under surface pale greyish brown; wings slightly darker towards the outer margin, and with an indistinct subapical whitish streak; a scarcely perceptible slender whitish marginal line; fringe as above; internal area of primaries whitish. Expanse of wings 9–12 lines.

Five specimens. Kurrachee, December 1879 and April 1880.

Also common in May, August, and November.

*ENNYCHIDÆ.*

—93. *RHODARIA ARIDA*, sp. n.

Primaries above sandy buff, with reddish costal margin spotted with blackish; central third occupied by a broad greyish belt with pale buff borders; a greyish diffused submarginal stripe; fringe grey, whitish at the base and traversed by a darker grey line: secondaries greyish brown, with fringe as in primaries: thorax testaceous; abdomen greyish brown. Under surface sericeous whitey brown; pri-

maries with yellowish costal border; a sandy whitish discal stripe, answering to the outer border of the central band on the upper surface; palpi ochreous. Expanse of wings 6 lines.

Five specimens. Kurrachee, May 1880.

The specimens of this species were unfortunately sent loose in a pill-box with several other small Lepidoptera, so that only one of the five examples is in fair condition, the others being a good deal rubbed.

#### STENIIDÆ.

##### 94. DIASEMIA (?) GEOMETRALIS (No. 22).

*Lepyrodes geometralis*, Guénée, Delt. et Pyral. p. 278 (1854).

Two specimens. Kurrachee, February 1879.

"Rare in December."—C. S.

#### SPILOMELIDÆ.

##### 95. ZEBRONIA AUROLINEALIS (No. 45).

*Zebronia aurolinealis*, Walker, Cat. Lep. Het. xvii. p. 478 (1859).

Two specimens. Kurrachee, July 1880.

#### MARGARODIDÆ.

##### 96. GLYPHODES UNIVOCALIS (No. 47).

*Glyphodes univocalis*, Walker, Cat. Lep. Het. xvii. p. 499 (1859).

Six specimens and a fragment. Kurrachee, July 1880.

These specimens were sent in a pill-box, and have all suffered more or less in transit. It is a rare species in collections, and would be worth sending in good condition.

#### BOTIDIDÆ.

##### 97. GODARA INCOMALIS (Nos. 23 & 27).

*Pionea incomalis*, Guénée, Delt. et Pyral. p. 369 (1854).

Four much-worn specimens. Kurrachee, May and December 1879.

According to Major Swinhoe this is a rare species; it also occurs in January.

#### SCOPARIIDÆ.

##### 98. STENOPTERYX HYBRIDALIS (No. 25).

*Pyralis hybridalis*, Hübner, Pyral. pl. 17. fig. 114.

One specimen of this widely distributed species. Kurrachee, January 1880.

##### 99. IHELLULA UNDALIS.

*Phalæna undalis*, Fabricius, Ent. Syst. iii. (2) p. 226 (1793).

One specimen of this European species. Kurrachee, May 1880.

#### — SCOTOMERA, gen. nov.

Allied to *Scoparia*, but differing in its more triangular primaries, the veins of which are all well separated and considerably less

parallel; secondaries decidedly smaller, the costal vein and the sub-costal branches well separated throughout their entire length, the inferior angle of the cell more produced; body more slender; palpi obliquely depressed.

-100. *SCOTOMERA TRISTIS*, sp. n. (No. 18).

Primaries above blackish grey, an indistinct angulated stripe across the basal fourth and a second near the outer margin whitish, costa regularly dotted with whitish; secondaries pale grey with slight brownish reflections; head creamy white; thorax dark grey; abdomen pale grey: under surface silvery whitish; primaries with black-spotted costal margin; legs whitish brown, mottled above with grey but very indistinctly. Expanse of wings 7 lines.

Two specimens. Kurrachee, April 1880.

PHYCIDÆ.

-101. *MELLA ZINCKENELLA*<sup>1</sup> (No. 19).

*Phycis zinckenella*, Treitschke, Schmett. Eur. ix. i. p. 201 (1832).

*Phycis etiella*, Treitschke, loc. cit. x. 3, p. 276 (1835).

*Mella dymnusalis*, Walker, Cat. Lep. Het. xix. p. 1018 (1859).

*Assara albicostalis*, Walker, loc. cit. xxvii. p. 80 (1863).

*Modiana scitivittalis*, Walker, loc. cit. p. 83 (1863).

*Alata anticalis*, Walker, loc. cit. p. 108 (1863).

*Arucha indicatalis*, Walker, loc. cit. p. 202 (1863).

*Alata subaurella*, Walker, loc. cit. xxxv. p. 1724 (1866).

*Alata hastiferella*, Walker, loc. cit. p. 1725 (1866).

Var. *Etiella decipiens*, Staudinger, Berl. ent. Zeit. p. 195 (1870).

*Crambus sabulinus*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. iv. p. 455 (1879).

Five specimens. Kurrachee, May and December 1879.

Also common in March and November; the species seems to be perfectly cosmopolitan in its range.

TINEIDÆ.

-102. *TINEA GLABRELLA*.

*Tinea glabrella*, Walker, Cat. Lep. Het. xxviii. p. 478 (1863).

One specimen. Kurrachee, May 1880.

-103. *HAPSIFERA EBURNEA*, sp. n. (No. 39).

Primaries pure snow-white, with the central longitudinal and external areas creamy white and speckled with brown, two or three darker brown spots in a longitudinal line below the cell, one across the end of the cell, and another halfway between the cell and the apex, a black spot at the origin of the first subcostal branch, and a marginal series of black dots; fringe with central and apical series

<sup>1</sup> The generic name *Etiella* being that of a synonym of the species, I have here adopted the first generic name given to the species by Walker,

of black irrorations : secondaries silvery white with pearly reflections : body snow-white. Wings below sordid white with faint golden reflections ; body white. Expanse of wings 10 lines.

One specimen. Kurrachee, July 1880.

-104. *ERIOCOTTIS FUSCANELLA*?

*Eriocottis fuscanelle*, Zeller, Isis, p. 813 (1847).

Two worn specimens. Kurrachee, May 1880.

The types and all the better examples in this series of Lepidoptera are incorporated with the national collection.

8. Note on some Points in the Anatomy of the Cæcum in the Rabbit (*Lepus cuniculus*) and Hare (*Lepus timidus*).  
By W. N. PARKER, Assistant in the Biological Laboratory of the Royal School of Mines.

[Received March 15, 1881.]

(Plate LIII.)

Some few months ago Prof. Huxley called my attention to the fact that Krause's description of the relations of the ileum and sacculus rotundus to the cæcum in the Rabbit (*Anatomie des Kaninchens*, pp. 156, 157) was incorrect, and proposed that I should look the matter up. I therefore examined the structure of these parts again, not only in the Rabbit, but also in the Hare, and in doing so noted the following resemblances and differences.

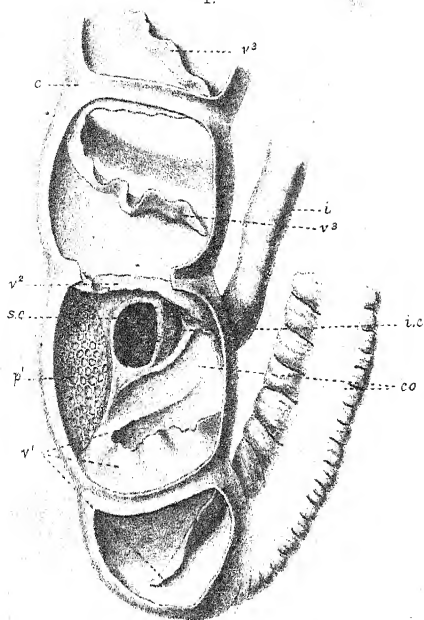
In both the cæcum, as is usual in grass-eating mammals which have a comparatively simple stomach, is of a relatively enormous size, being on an average, when straightened out, about 1 foot 8 inches long in a moderate-sized Rabbit, and rather more in the Hare. This measurement includes the *appendix vermiformis*, which varies from about  $3\frac{1}{2}$  to  $4\frac{1}{2}$  inches in length.

The ileum appears externally, in both species, to pass directly into the sacculus rotundus, at right angles to the long axis of the cæcum. The sacculus has an ovoidal shape, its long axis being transverse to the long axis of the cæcum in the Rabbit (fig. iv.), but longitudinal in the Hare (fig. ii.)

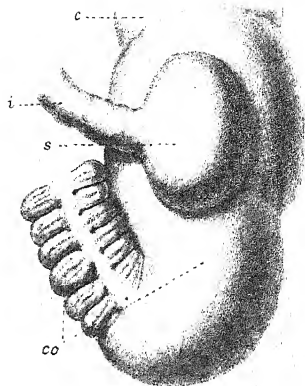
In both also the cæcum passes insensibly into the colon, which runs straight from it for about 2 or  $2\frac{1}{4}$  inches, and then makes a sudden bend in the opposite direction, taking on the characteristic form, with the sacculations and the three *tæniæ coli*.

Daubenton (*Histoire Naturelle*, tome sixième) describes the sacculus as a pocket near the junction of the ileum with the colon, and gives figures (pls. xl., xli. pp. 273, 274), of the Hare's cæcum both entire and cut open, the latter showing the two distinct apertures of the sacculus and ileum into the colon (fig. i. s.c, i.c); but he gives no details on this point in the Rabbit (p. 321). Krause describes these

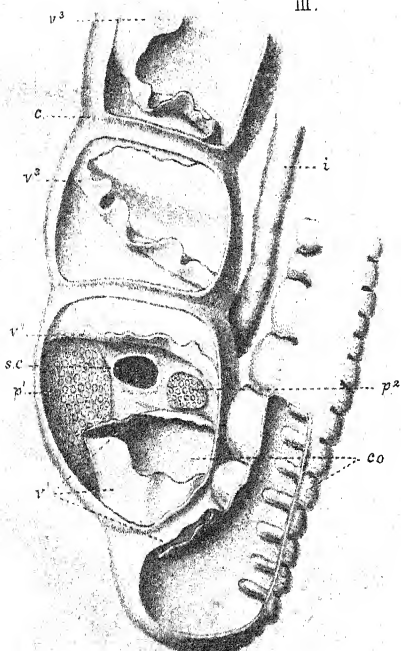
I.



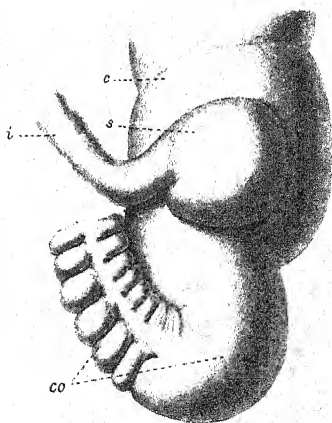
II.



III.



IV.





two apertures as separate in the Rabbit ; but this is not the case, as in the latter animal the ileum opens directly into the sacculus, and there is thus only one common aperture into the colon (fig. III. s.e) The lips of this round aperture form the so-called ileo-colic valve ; and its edge is often prolonged into a short process on one side.

In other respects, with the exception of the number of turns of the spiral valve, of which mention is made below, the cæca of these two species present no important differences ; and the following description applies to both of them.

The only other reference to this matter I have been able to find is in a paper by Dr. Edwards Crisp, " On some Points relating to the Habits and Anatomy of the Oceanic and of the Freshwater Ducks, and also of the Hare (*Lepus timidus*) and of the Rabbit (*L. cuniculus*), in relation to the Question of Hybridism " (Proc. Zool. Soc. 1861, p. 82). In this paper, however, Dr. Crisp states that he has compared the various viscera of these two animals, but has found no important difference in them.

In the Piping Hare (*Lagomys pusillus*) there are two cæca, a large and a small one. It seems probable that the latter is simply an elongated *sacculus rotundus*<sup>1</sup>.

Both the *sacculus rotundus* and the *appendix vermiformis* consist internally of a mass of lymphoid tissue, abundantly supplied with lymphatic vessels, each answering to an enormous Peyer's patch, and having the ordinary structure<sup>2</sup>. Another Peyer's patch, averaging about  $\frac{3}{4}$  of an inch in diameter, but varying much in size and shape, occurs in the colon close to the aperture of the sacculus, on the side which is furthest from the entrance of the ileum (figs. I. & III. p<sup>1</sup>). A much smaller one (fig. III. p<sup>2</sup>) sometimes occurs on the other side ; but this is very inconstant.

A valve begins a short distance below the entrance of the ileum, and makes about one turn (*v*<sup>2</sup>), passing close above the ileo-colic aperture, and is then either continued into the spiral valve of the cæcum (*v*<sup>3</sup>), as seen in fig. III., or else ends off gradually, and the spiral valve begins about  $\frac{1}{4}$  or  $\frac{3}{8}$  of an inch higher up (fig. I.). This variation is seen in both species.

Another valve, which is mentioned by Daubenton, and which Prof. Huxley in his lectures speaks of as the *intracolic valve* (*v*<sup>1</sup>), begins close to the sharp bend of the colon, and then makes one turn in a spiral manner, ending off gradually, but being very large in the middle ; it thus is capable of closing the way into the colon, and causing the contents of the ileum to pass up the cæcum.

In the Rabbit the spiral valve makes 24 turns, not including the part passing close above the ileo-colic aperture, which, as stated above, is quite separate in many cases. In the Hare the number of turns was 29 in the specimens I examined.

The method I found to be most successful in making out the structure and relations of these parts was, to carefully clean out the

<sup>1</sup> See Gegenbaur's ' Elements of Comp. Anat., ' English edition, p. 562, fig. 318 (after Pallas).

<sup>2</sup> See fig. 1, p. 17, of the Harveian Oration 1873, by Dr. Rolleston, F.R.S.

cæcum, with a portion of both ileum and colon, and then to distend it with  $\frac{1}{2}$ -per-cent. chromic acid, placing it in a vessel of the same fluid. This was changed after the first day, and replaced by acid of the same strength, in which it was left for a week or so, after which the cæcum was washed, and then distended with, and placed in, weak spirit for a short time, and finally in strong methylated spirit.

## EXPLANATION OF PLATE LIII.

Figs. I., II. *Lepus timidus*.III., IV. *Lepus cuniculus*.

c, cæcum. co, colon. i, ileum. i.c, ileo-colic aperture.  $p^1$ , large intracolic Peyer's patch.  $p^2$ , small intracolic Peyer's patch. s, sacculus rotundus. s.c, aperture of sacculus into colon.  $v^1$ , large intracolic valve.  $v^2$ , second valve, which is sometimes continuous with the spiral valve of the cæcum.  $v^3$ , spiral valve of the cæcum.

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May 17, 1881.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April 1881:—

The total number of registered additions to the Society's Menagerie during the month of April was 117, of which 66 were by presentation, 5 by birth, 24 by purchase, 7 by exchange; and 15 were received on deposit. The total number of departures during the same period, by death and removals, was 109.

The most remarkable additions during the month of April were as follows:—

1. An Indian Darter, *Plotus melanogaster*, received in exchange from the Zoological Gardens, Calcutta, April 8th.

This is the first living example we have received of the Indian Darter, previous examples of this genus having belonged to *Plotus ankinga* of South America and *Plotus levaillanti* of Africa. Of the former we have at present a specimen in the Gardens. The Indian Darter is readily distinguishable from the American species by its longer and more slender neck and longer tail, not to mention differences of coloration.

2. A young female Beisa Antelope (*Oryx beisa*), born in the Gardens April 12th, believed to be the first example of this Antelope that has been bred in captivity. I exhibit a coloured drawing of this animal by Mr. Smit (see Plate LIV.), which may be compared with the figures of the young *Leucoryx* given in the 'Knowsley Menagerie' (plate xvi.).

3. A Mountain Ka Ka (*Nestor notabilis*), transmitted as a present to the Society by Dr. A. de Lautour, of Otago, New Zealand. Dr. de Lautour has favoured me with the subjoined particulars concerning this bird:—

"I have the pleasure of informing you that I am sending home for



the Society a specimen of the Kea (*Nestor notabilis*), or Mountain Parrot, a bird celebrated (or, rather, notorious) for its sheep-destroying proclivities.

"Many abler pens than mine have already written about their habits; but I was fortunate enough to be, perhaps, the first to send home a specimen of their work in the shape of the colon and lumbar vertebrae of a sheep, in which colotomy had been performed by one of these birds.

"This specimen was shown at a meeting of the Pathological Society by my friend and former master Mr. John Wood, F.R.S., and is now in the Museum of the Royal College of Surgeons of England.

"The bird which I am now sending home has been in my possession for nearly two years. It was caught in the act of attacking some sheep which a shepherd was bringing down off the tops of some ranges in the back country. He luckily succeeded in knocking it over with a stone, cut its wings, and brought his captive down. In effecting the capture the shepherd suffered considerable loss as to his trousers and other garments, and received many scratches from its formidable beak and claws. These same scratches had not entirely healed when he came down here under my care some ten days later, suffering from a broken leg (this, by the way, was not done by the Kea).

"While I have had the Kea, his diet has consisted mainly of mutton, raw; he does not care for cooked meat, but will take it if very hungry. Occasionally he will take beef; and he is fond of pork. Popularly he is said to prefer fat; but in confinement he chooses the lean and leaves the fat. He does not care for biscuit; but he likes the seed of the sow-thistle."

Mr. Sclater laid on the table a skin of one of the examples of the Parrot, of the genus *Chrysotis*, of which the Society had of late years received several examples from the island of St. Lucia, and which he had hitherto called *Chrysotis bouqueti*<sup>1</sup>; and explained the reasons which had induced him to the conclusion that he had wrongly determined the species, which was really *C. versicolor* (Müller)<sup>2</sup>, while the species from Dominica recently named by Mr. Lawrence *C. nicholli*<sup>3</sup> was, in his opinion, the true *C. bouqueti*.

Mr. Sclater remarked that the exact habitats of all the four species of *Chrysotis* of the Lesser Antilles were now known to us, and were as follows:—

1. *C. augusta*, Dominica.
2. *C. bouqueti*, Dominica.
3. *C. versicolor*, St. Lucia.
4. *C. guildingi*, St. Vincent.

It was singular that no species of *Chrysotis* had yet been dis-

<sup>1</sup> P.Z.S. 1874, p. 323, 1875, p. 61, t. xx. et p. 316; et List of An. 1877, p. 263, et 1879, p. 295.

<sup>2</sup> *C. cyanopsis*, Finsch, Papag. ii. p. 323.

<sup>3</sup> Pr. U.S. Nat. Mus. 1880, p. 254.

covered in Martinique and Guadaloupe. If not now existing in these islands, there could be little doubt that the form must formerly have occurred there.

The following papers were read :—

1. List of Land and Freshwater Shells collected in Sumatra and Borneo, with Descriptions of new Species. By CARL BOCK.

[Received April 4, 1881.]

(Plate LV.)

The specimens mentioned in this paper were collected in the highlands of Padang, in Sumatra, and in the east and south part of Borneo, during my recent travels.

In determining the species and comparing the specimens with those in the British Museum, I have to acknowledge much assistance received from Mr. Edgar Smith. In the case of such difficult forms as *Melania*, I have not ventured to determine the species myself, but have forwarded my specimens for determination to Dr. A. Brot, of Geneva, who is our highest authority on this group of freshwater shells.

### *I. Shells collected in the District of Padang, Sumatra.*

#### A. LAND SHELLS.

1. NANINA (ARIOPHANTA) FOVEATA, Pfr.

Of this fine sinistral *Helix* I found two adult live shells at Sidjoendjoeng.

2. NANINA (HEMIPLECTA) DENSE, var., Adams & Reeve.

*Nanina (Hemiplecta) schumacheriana*, Pfr.

Three specimens from Mount Sago and Sidjoendjoeng. Mr. Wallace found this species in Borneo.

3. HELIX (CAMÆNA) TOMENTOSA, Pfr.

Only two specimens found (one adult) at Sidjoendjoeng.

4. NANINA (XESTA) MALACCANA, Pfr.

This brittle shell I found very abundant in the coffee-plantations at Paio.

5. HELIX (PLECTOTROPIS) SUMATRANA (v. Martens).

At Ajer Mantjoer ; scarce.

6. HELIX (NANINA) GRANARIA, sp. nov. (Plate LV. fig. 1.)

Shell thin, sinistral, conical, depressed, of an olive-brown colour,

becoming pinkish grey at the apex, narrowly umbilicated, whorls 6, oblique arcuate, sculptured with lines of growth and concentric finely granular striae, producing a shagreened appearance, especially on the last whorl, which is also considerably wrinkled, and bears a somewhat raised ridge or keel at the periphery, which, however, does not produce an angle, not descending in front. Whorls of the spire only a little convex, the last large, rather ventricose. Spire shortly conical, with the apex obtuse. Aperture large, broadly obliquely lunate, of a somewhat mauve tint within. Peristome thin, simple, only very shortly expanded over the umbilicus.

*Hab.* Mount Sago, at an elevation of 2000 feet, only *one* specimen found, in a decayed trunk. Like the rest of the *Naninae* I found in Sumatra and Borneo, this also is sinistral. Greatest diameter 40 millim., height 31 millim.

7. *HELIX (NANINA) MAARSEVEENI*, sp. nov. (Plate LV. fig. 2.)

Shell perforate, sinistral, depressedly trochiform, thick, of a light brown horn-colour, somewhat paler round the umbilicated region. Spire conically depressed, with the apex obtuse. Whorls 7, sculptured with feebly granulated, obliquely arcuate lines of growth, and increasing slowly; last whorl with a very acute pale keel about the middle, below the carina rather concave than convex, sculptured like the upper surface, the lines being rather flexuous. Aperture oblique, angularly lunate. Peristome thick; upper margin above the keel short, oblique, rectilinear, the basal very arcuate, towards perforation somewhat expanded. Greatest diameter 33 millim., axis 14 millim.

*Hab.* Sidjoendjoeng. I have associated the name of Mr. Maarseven (the Assistant Resident at Sidjoendjoeng) with this shell, of which I only found three specimens.

A near ally in form and colour is *H. hugonis*, Pfr., from Labuan; but *H. maarseveeni* has an extra whorl, is umbilicated, and the spire is considerably less elevated; and the granular sculpture in *H. hugonis* is much stronger. *H. maarseveeni* comes much nearer *Helix mindaiensis*, found by me in Borneo; but that has only six whorls.

8. *HELIX SMITHI*, sp. nov. (Plate LV. fig. 3.)

Shell thin, orbicular, umbilicated, flatly depressed, semitransparent, of a greyish white colour, covered with a thin epidermis of a light horn-colour, spire flattened. Whorls 4, flattish, sculptured with fine lines of growth, the last slightly descending at the mouth, broad, with a strongly marked obtuse keel, and a broad distinct groove above, below convex, obtusely ridged round the deep umbilicus. Aperture large, subquadrangular, oblique. Peristome thin; outer margin expanded, reflexed, especially in the umbilical region. Greatest diameter across 21 millim., height 8 millim.

*Hab.* Paio, Sumatra. Two specimens found (only 1 adult).

*Helix smithi* is nearly allied to *H. caseus*, Pfr., from Siam; but the latter differs in having a less acute keel on the last whorl,

which *descends* considerably, and the peristome is almost continuous and ovate. I have associated with this shell the name of Mr. Edgar Smith, the well-known conchologist of the British Museum.

9. *HELIX* (*GEOTROCHUS*) *RUFO-FILOSA*, sp. nov. (Plate LV. fig. 4.)

Shell shortly conical, narrowly umbilicated, thin, semitransparent, of a greyish or horn-colour, sometimes with a thread-like red line bordering the sutures and encircling the last whorl at the periphery. Spire with rectilinear outlines, converging at an angle of about 30°, rather obtuse at the apex. Whorls 7, very obliquely striated, slowly increasing, keeled beneath immediately above the suture; three or four uppermost rather more convex than those beneath, which are but slightly so; last volution acutely carinate at the middle, and convexly flattened beneath. Aperture small, oblique. Peristome thin, outer margin above the keel scarcely expanded, beneath it feebly thickened and narrowly reflexed, in the umbilical region more expanded and partly concealing the perforation. Length from 10 to 11 millim., greatest diameter of base also 10–11 millim.

*Hab.* In the forest at Paio, 1500 feet above the sea.

Only six specimens found; rare.

10. *HELICARION SUMATRENSIS*, Schepm.

*Hab.* Paio; very rare.

11. *BULIMUS* (*STENOGYRA*) *PAIOENSIS*, sp. nov. (Plate LV. fig. 5.)

Shell elongate, subulate, imperforate, of a dirty greyish-white colour, covered with a somewhat deciduous and coarsish olive epidermis. Whorls 12, apical ones obtuse, glossy, vitreous, these and the few succeeding rather convex and slowly enlarging, the five last proportionally longer and flatter, increasing more in length than breadth, and separated by a rather oblique deepish suture. Sculpture consists of coarsish oblique flexuous, indistinctly subgranose raised lines of increment. Aperture elongate, subpyriform, acute above, occupying rather more than one fifth of the entire length of the shell. Outer lip (viewed laterally) oblique, a little excurved near the suture, simple, thin. Columella whitish, slightly arcuate and thickened, appressed to the whorl, connected with the extremity of the labrum by a very thin callosity. Length 40 millim., diameter  $7\frac{1}{2}$  millim.; aperture 9 millim. long, 3 millim. broad.

*Hab.* Paio, Sumatra, 1500 feet above the sea.

The animal is of a yellow colour, has a short foot, and carries its shell in an oblique position.

I never met with this interesting species in any other spot in the highlands; and even at Paio it appears to be rare; for in all, after close search, I found but fourteen specimens.

12. *BULIMUS* (*AMPHIDROMUS*) *ADAMSI*, Reeve.

*Hab.* Sidjoendjoeng, Paio, &c.

13. *VITRINA HYALEA*, sp. nov. (Plate LV. fig. 6.)

Shell depressedly globose, subauriform, olive-brown, glossy, sculptured with very fine lines of growth and microscopic spiral striæ. Spire small, pale, hardly raised above the last whorl. Volutions 2 to 3, depressedly margined at the suture, last very large. Aperture very large, subhorizontal or only a little oblique, lunar-rounded. Outer lip, seen from above, feebly incurved near the suture, the somewhat excurved columellar margin of the peristome thin, membranous. Greatest diameter 20 millim.

*Hab.* Ajer Angat, near Korinthji.

This species is darker in colour than most others of this genus, but somewhat lighter than the Tasmanian *V. milligani*.

14. *CLAUSILIA SUMATRANA*, v. Martens.

*Hab.* Common in the coffee-plantations at Paio, Sumatra.

15. *PUPINA SUPERBA*, Pfr.

I collected three specimens at Paio.

16. *CYCLOPHORUS PLANORBULUS*, Lam.

In the dense forests at Sidjoendjoeng, with the aid of some natives, I secured some fifty specimens, all living, and with opercula; but the species is rare, and requires a close search amongst the decayed leaves and in the damp soil; it varies considerably in size.

17. *CYCLOPHORUS EXIMIUS*, Mousson.

Of this glorious shell, the pride of the Sumatra forests, I succeeded in collecting some sixty specimens at Sidjoendjoeng. I first found dead shells in the immense forests there pretty common; and being determined to exhaust the place of live ones, as much as possible, of this fine species, I set some natives to work every day to pull down the decayed trees that were filled with earthy matter, and also to look amongst the masses of dead leaves on the ground; but the former seemed to be their favourite place of resort. We succeeded in finding two or three perfect living specimens every day; but when I looked over all that had been collected, over 50 per cent. were dead white specimens with hardly any colour at all; 30 per cent. were shells in various stages of growth, but without a lip, and in most cases the last whorl near the mouth was broken and rounded; 20 per cent. is left for fine full-grown examples possessing the bronzy shining epidermis.

*Hab.* Mount Sago and Sidjoendjoeng.

The Dutch Sumatran Expedition found 11 specimens, all dead; but it is interesting to note the localities, all being places with immense forest vegetation:—1 spec. near Silagoi; 1 spec. Soengei Aboe; 2 spec. near Moeara Labol; 1, Mount Korinthji, at a height of 1000 metres; 4 spec. Loeboe Gedang; 2 spec. Ajer Boesock.

## 18. CYCLOPHORUS TUBA, Sow.

Mount Sago and Sidjoendjoeng ; rarer than the foregoing species.

## 19. MEGALOMASTOMA SECTILABRUM, Gould.

Found 8 specimens at Paio.

## B. FRESHWATER SHELLS.

The ponds of the Padong district teem with different species of *Melania*, *Ampullaria*, and *Paludina*. Such of these as I could not make out have been determined by Dr. Aug. Brot, of Geneva.

## 20. AMPULLARIA AMPULLACEA, Linn.

All over the highlands in ponds, and in the "sawahs" (rice-fields).

## 21. PALUDINA INGALLSIANA, Lea.

One specimen from Boea.

## 22. PALUDINA HAMILTONI.

The specimens differ from those in the British Museum in being more rounded at the top.

## 23. PALUDINA SUMATRENSIS, Dunker.

Common in the "sawahs" (rice-fields) at Boea, and in the rivers.

## 24. MELANIA DATURA, Dohrn.

Boea.

## 25. MELANIA SEMIGRANOSA, Busch.

Found at Boea and Tanar Datar.

26. MELANIA LIRATA, Bens., var. *granosa*.

## 27. MELANIA LÆVIGATA.

*Locality.* Boea and Tanar Datar.

## 28. MELANIA MALAYANA, Issel.

*Locality.* Boea and Tanar Datar.

## 29. MELANIA SUMATRENSIS, Brot.

One young specimen found at Boea.

## 30. MELANIA BOEANA, sp. nov.

## 31. MELANIA PROVISORIA, sp. nov.

## 32. MELANIA BOCKII, sp. nov.

*Locality.* Boea.

The new species of *Melania* will be described by Dr. Brot in M. Crosse's 'Journal de Conchyliologie.'

## 33. CORBICULA GRACILIS, Prime.

Abundant in all the lakes in Sumatra, especially Lake Singkarak. The shell is fished in quantities, and used for making lime for betel-chewing.

## 34. UNIO DIMOTUS, Lea.

Abundant.

## II. Shells collected in Koetei and in the Amontai and Bandjermasin Districts of Borneo.

## HELICIDÆ.

## 1. NANINA (RHYSSOTA) BROOKEI, Adams &amp; Reeve.

I found dead specimens in Koetei. The Dyaks use them as ornaments in the top of the lids of their arrow-cases. Six *live* specimens at Mindai (in Amontai district). It is, however, rare, hiding in layers of decayed leaves.

## 2. NANINA (XESTA) CONSUL, Pfeiffer.

Found at Mindai. Two specimens.

## 3. HELIX MINDAIENSIS, nov. sp. (Plate LV. fig. 7.)

Shell very slightly umbilicated, sinistral, convexly conoid, semi-transparent, of a reddish brown colour, with a white-tipped lip. Spire conical, with somewhat convex outlines and the apex obtuse. Whorls 6, but slightly convex, sculptured with finely granulated radiating striæ, regularly increasing; the last acutely keeled. Aperture oblique, lunate. Peristome sharp, slightly thickened; upper margin short, oblique, the basal (seen from beneath) rather sinuous. Greatest diam. 30 millim., axis 13 millim.

*Hab.* Mindai (Amontai district), very abundant amongst the decaying leaves in the forest.

This species is of a darker colour than *Helix marseveeni*, has one whorl less, has more convex outlines to the spire, is not so sharply keeled around the last whorl, and more narrowly umbilicated. Its sculpture, too, is rather more coarsely granular.

## 4. HELIX (VIDENA) METCALFEI, Pfeiffer.

One specimen, collected at Mindai.

## 5. HELIX (VIDENA) PLANORBIS, Lesson.

From Mindai. Scarce.

## 6. BULIMUS (AMPHIDROMUS) INTERRUPTUS, Müller.

This shell was very abundant in Bandjermasin, both the dextral and sinistral forms, and variously coloured; of the rare pure white variety only one specimen was obtained. After heavy rains the trees were quite spotted with them.

7. *SCARABUS BORNEENSIS*, A. Adams.

Only one specimen, found at Bandjermasin.

8. *PTEROCYCLOS MINDAIENSIS*, sp. n. (Plate LV. figs. 8, 8a, 8b.)

Shell depressed, orbicular, rather solid, dark reddish brown, varied with zigzag narrow white markings both above and below, covered with a greenish-brown velvety epidermis bearing two series of close-set short hairs, one above and the other beneath the periphery, the former winding up the suture. These cilia are invariably worn off in adult shells. Whorls 5, rounded, divided by a deep suture, marked with distinct spiral striæ and lines of growth. Peristome double, outer margin considerably expanded, especially at the upper part where it joins the body-whorl, but less reflexed than towards the base. Inner margin simple. Greatest diameter 19 millim., axis 5.

Operculum very concave exteriorly, consisting of seven narrow whorls which are coarsely obliquely striated, with the outer margins exerted at the sutural line.

This species very closely resembles *P. lowianus*, Pfr., from the island of Labuan. It is, however, rather larger, has a darker and thicker epidermis, which is ciliated, that of *P. lowianus*, as far as we know, lacking that peculiarity; and the peristome is more expanded and reflexed. The opercula of these two forms present such difference of character as to indicate at once their specific distinctness. That of *P. lowianus* has exteriorly a deep groove separating the whorls, which stand up erect and lamelliform. In *P. mindaiensis* the whorls rest one upon another, and the surface is regularly concave.

*Hab.* Mindai (Amontai district); exceedingly common amongst the decaying leaves.

Borneo is especially rich in specimens of the genus *Pterocyclos*. In some places, particularly at Mindai, the ground was literally swarming with *Pt. mindaiensis*; they keep amongst and feed on decayed leaves.

9. *OPISTHOPORUS EURYOMPHALUS*, Pfr.

Only two specimens from Long Wai, Koeti; one has the tube directed the opposite way. Two specimens from Mindai.

10. *LEPTOPOMA* (Pfr.) LOWI, Pfr.11. *L. DUPLICATUM*, Pfr.12. *L. BARBATUM*, Pfr.13. *L. SUBCONICUM*, Pfr.14. *L. MASSENA*, Less.

All from Mindai. Only a couple of specimens of each found.

15. *CERITHIDEA* (Sow.) *OBTUSA*, Lam.

Abundant at Bandjermasin in the swamps; they were more on land than in the river. Amongst the numbers collected I only found one with *perfect apex*.



## 16. CERITHIDEA CHARBONNIERI, Petit.

Bandjermasin; not so common as the former.

## 17. CLEA NIGRICANS, Bens.

Bandjermasin; common. Only in young shells is the apex perfect; in the old ones, the spire is broken and eroded.

Dr. Brot makes out two varieties—*C. maxima*, H. Ad., and *C. fasciata*, H. Ad.

## 18. CLEA BOCKII, sp. nov.

[This species will be described by Dr. A. Brot in M. Crosse's 'Journal de Conchyliologie.']

## NERITIDÆ.

## 19. NERITINA DEPRESSA, Benson.

Common in the brackish waters at Bandjermasin.

## 20. NERITINA (CLITHON) ACULEATA (Gmelin).

Bandjermasin; rather rare. Six specimens found, with the spines only feebly developed.

## 21. NERITINA PIPERINA, Chem.

Exceedingly abundant at Bandjermasin, and ornamented in great variety.

## 22. AURICULA JUDÆ, Lin.

On the Koeti coast, amongst the mangroves and Casuarinæ.

## EXPLANATION OF PLATE LV.

- Fig. 1. *Helix granaria*, p. 628.  
 2. *Helix maarseveeni*, p. 629.  
 3. *Helix smithi*, p. 629.  
 4. *Helix rufo-filosa*, p. 630.  
 5. *Bulimus patiensis*, p. 630.

- Fig. 6. *Vitrina hyalea*, p. 631.  
 7. *Helix mindaiensis*, p. 633.  
 8, 8a, 8. *Pterocyclos mindaiensis*,  
 p. 634.

## 2. Description of eight new Species of Shells.

By G. B. SOWERBY, Jun.

[Received April 7, 1881.]

(Plate LVI.)

## 1. CONUS THOMASI, n. sp. (Plate LVI. fig. 4.)

*Testa elongata, solida, albida vel pallide carnea, minute cancellata, epidermide fusca crassa induta; spira obtusa, vix elevata; anfractus superne declives, spiraliter minutissime striati; anfr. ultimus superne rotunde angulatus, infra angulum aliquanto convexus, deinde rectiusculus; apertura modica, supra et infra subæqualiter lata, fauce pallide carnea.*

Long. 75, diam. 35 millim.

Hab. Red Sea.

Compared with *C. terebellum*, to which this species is allied, it is a smooth shell with a shorter spire. Having a single specimen of *C. thomasi* some years ago, I had some thought of describing it as a new species, but hesitated to do so on account of its proximity to *C. terebellum*. Having now, however, seen several specimens, and compared them with a large series of *C. terebellum*, I have no difficulty in making the distinction. In the collections of the late Mr. Thomas Lombe Taylor and Mr. Hopeley White there were specimens of the species above described under the name of *C. pastinaica* (Lamarck)—an error caused by Lovell Reeve having figured and described under that name in the 'Conchologia Iconica' (*Conus*, fig. 257) a shell of somewhat similar appearance, but which has been shown by Mr. Edgar Smith to have been a worn specimen of *C. virgo*, now in the British Museum. It is not known what has become of the type of Lamarck's *C. pastinaica*; but from his description it would seem to have no affinity whatever with Reeve's shell so named.

The species which I have named in honour of M. Thomas of Brest is represented in his collection by the specimen which I have taken for the type. The other specimens which I have mentioned are smaller, and have rather more of a bluish or faint lilac tinge of colour.

## 2. *CONUS PREVOSTI*, n. sp. (Plate LVI. fig. 3.)

*Testa elongato-cylindracea, laevi, infra sulcata, albida, aurantio obscure fasciata, lineis numerosis minutis aurantiacis irregulariter undulatis et angulatis scripta; spira elata, gradata; anfractus superne leviter concavi, striis duobus spiraliter sculpti; anfr. ultimus superne angulatus, infra angulum convexiusculus; apertura modica, basin versus aliquanto latior, fauce lutea.*

Long. 40, diam. 15 millim.

*Hab.* New Caledonia.

A beautiful and remarkable species, of an elongated form, and a style of marking that would bring it just within the confines of the "cylinder" or "textile" group. The orange lines are very fine, mostly running longitudinally, in some places parallel and zigzag, in others leaving triangular white spaces as in *C. textile*, and others of that group. The specimen forms part of the collection of M. Thomas of Brest; another specimen is in the collection of Dr. Prevost of Alençon.

## 3. *CONUS BOCKI*, n. sp. (Plate LVI. fig. 7.)

*Testa turbinata, pallide lutea, luteo-fusco transversim multifasciata, et longitudinaliter strigata, hic illic nigro fusco radiata; spira breviuscula, albida, promiscue luteo strigata, ad apicem prominula; anfractus superne planati, cancellati, ad angulum coronati; anfr. ultimus superne tuberculis grandibus coronatus, infra angulum laevigatus, deinde leviter granoso-costatus; apertura alba, medio-criter lata; labrum leviter arcuatum.*

Long. 60, diam. 32 millim.

*Hab.* Amboyna (*Carl Bock*).

Resembling the Chinese *C. striatus* in form, but a much smoother shell than any of that species that I have met with (and I have seen some hundreds); and it is more deeply coloured; but the chief difference is in the crown. *C. sulcatus* is characterized by a sharp undulating keel at the angle, forming a raised ridge round the depressed whorls of the spire; while in *C. bocki* the crown is formed of slightly angular nodules, between which the angle is rounded.

I have seen only a single specimen of this interesting shell, which was brought by Mr. Carl Bock from the above-named locality, and is now in the collection of Dr. Prevost.

4. *CONUS GLOYNEI*, n. sp. (Plate LVI. fig. 5.)

*Testa abbreviato-turbinata, solida, castanea, brunneo late bifasciata; spira abbreviata, conica, brunnea; anfractus superne leviter concavi, spiraleriter profunde trisulcati; anfr. ultimus ad angulum leviter coronatus, infra angulum levissime convexus, leviusculus, vel minutissime striatus, basin versus valide costatus; apertura angusta, albida; labrum ad angulum leviter emarginatum.*

Long. 26, diam. 16 millim.

*Hab.* — ?

A short brown Cone of no very striking character, excepting perhaps that the grooves of the spire are unusually deep. Although of ordinary appearance, I cannot identify it with any known species. The shell was given me by Mr. C. P. Gloyne, who had no information as to its habitat.

5. *CONUS LOMBEI*, n. sp. (Plate LVI. fig. 6.)

*Testa conica, solidiuscula, rufo-fusca; spira acuta, subgradata; anfractus superne declives, levi, angulati, ad angulum maculis albidis numerosis ornati; anfr. ultimus superne subacute angulatus, ad latera prope rectus, levigatus, basin versus oblique sulcatus; apertura angusta, fauce purpurea; labrum ad angulum vix emarginatum.*

Long. 22, diam. 10 millim.

*Hab.* Mauritius ?

A small reddish-brown Cone, with a purple interior, and white spots on the angle and spire, giving it a coronated appearance, although the angle is free from nodules.

The specimen which is now in the British Museum was in the collection of the late Thomas Lombe Taylor, with a label "*Conus*, nov. sp., Mauritius." As the labels of that collection were loose, and many of them got shifted, the habitat assigned to this species is very uncertain.

6. *CANCELLARIA WILMERI*, n. sp. (Plate LVI. fig. 2.)

*Testa oblonga, acuminata, fusca; anfractus 7, convexiusculi, superne anguste excavati, costis numerosis noduliferis et liris transversis cancellati; spira elata; apertura oblongo-ovata, fusca; labrum concavo depressum, arcuatum, superne emarginatum; columella curta, rectiuscula, minute triplicata.*

Long. 11, diam. 5 millim.

*Hab.* Port Blair, Andaman Islands (*Major Wilmer*).

Resembling in texture the Mauritian *C. scalata*, but of a more acuminate form, the sutural depression being narrow and deep. The colour is light reddish brown within and without, slightly paler on the ribs and nodules.

7. *OVULUM VIDLERI*, n. sp. (Plate LVI. fig. 1.)

*Testa elongata, utrinque acuminata, transversim striata, cerasina, terminibus vivide aurantiacis, dorso medio gibbosiusculo, levissime angulato, levigato vel obsolete costato; apertura angusta, antice latior; labium laeve, antice subangulatum; columella callosa, postice conspicue uniplicata.*

Long. 21, diam. 7 millim.

*Hab.* Monterey, west coast of America (*Mr. Vidler*).

An *Ovulum* of an elongated form, of a cherry-red colour, with bright orange extremities. The back is nearly smooth; and the ends are transversely striated. Several of the specimens brought by Mr. Vidler are smaller, smoother, and more slender than the one I have chosen as type.

8. *CYPRÆA SMITHI*, n. sp. (Plate LVI. fig. 8.)

*Testa ovata, crassiuscula, umbilicata, pallidissime cinerea, minute fusco-flavescenti lenticulata, dorsi medio maculis duabus subquadratis castaneo-purpureis picta, lateribus albis rufo-fusco punctatis, basi convexa, alba; apertura modica, postice arcuata; dentes labii circiter 16, breves, obtusi, albi; columellæ circiter 19, tenues, rubro-fusci.*

Long. 19, lat. 10 millim.

*Hab.* North-west coast of Australia.

Specimen presented to the British Museum.

The chief character of this species is to be found in the teeth, those of the inner lip or columella being more numerous and much thinner than those of the outer, and of a reddish-brown colour. The only other species presenting this character is *C. pyriformis*, which is much larger, more pear-shaped, and an inhabitant of the Ceylon coast. Looking merely at the back of the shell it would pass for one of the robust Australian forms of *C. fimbriata* (of which I consider *C. macula* of Adams a variety); but a glance at the mouth at once reveals the difference.

I have pleasure in dedicating this species to Mr. Edgar Smith, of the Zoological Department, British Museum.

P.S.—Since I read this paper, I have seen a shell in the British Museum (labelled "Port Essington") which leads me to consider *Cypræa smithi* a variety of *C. pyriformis*. The shell is intermediate in size between the average *C. pyriformis* and the shell above described, and has the shape of the former with the white base of the latter.

## EXPLANATION OF PLATE LVI.

- Fig. 1. *Ovulum vidleri*, p. 638.  
 2. *Cancellaria wilmeri*, p. 637.  
 3. *Conus prevosti*, p. 636.  
 4. — *thomasi*, p. 635.  
 5. — *gloynei*, p. 637.  
 6. — *lombei*, p. 637.  
 7. — *bocki*, p. 636.  
 8. *Cypræa pyriformis*, var. *smithi*, p. 638.

3. Notes on the Anatomy and Systematic Position of the Jaçanás (*Parridæ*). By W. A. FORBES, B.A., Prosector to the Society.

[Received April 8, 1881.]

It having lately been my good fortune to dissect two specimens of *Parra jacana*, from Pernambuco, and an eviscerated specimen of *Metopidius africanus*, as well as to examine skeletons and skins of some other species of this group, a few notes on their anatomy may be acceptable to the Society, the more so on account of the very considerable difference of opinion that has hitherto existed amongst systematic ornithologists as to the true relationships of this group. Two main views on this subject have been put forward, one placing the Jaçanás near the Rails (*Rallidæ*), the other asserting that they are, essentially, modified Plovers. The former of these views has been maintained by Jerdon<sup>1</sup>, Sundevall<sup>2</sup>, and Milne-Edwards<sup>3</sup>, to mention only some of the most recent ornithological writers of importance, as well as by the illustrious Nitzsch in his classical memoir on the pterylography of birds<sup>4</sup>. The latter view has been adopted by Messrs. Sclater and Salvin in their 'Nomenclator,' where the *Parridæ* are interpolated between the *Ædicnemidæ* and the *Charadriidæ* as members of the order "*Limicolæ*"<sup>5</sup>. The late Prof. Garrod,

<sup>1</sup> Birds of India, iii. p. 707.

<sup>2</sup> Tentamen, p. 130 (1872).

<sup>3</sup> Oiseaux Fossiles, ii. p. 110 (1869-71).

<sup>4</sup> Pterylography, Ray Society's edition, p. 126.

<sup>5</sup> *Op. cit.* p. 142 (London, 1873). The term "*Limicolæ*" was, I believe, originally used by Nitzsch (*Pterylogr.* p. 194) to include the birds now included in the "families" *Charadriidæ* and *Scolopaciidæ*, together with some aberrant forms, such as *Dromas*, *Cursorius*, *Thinocorus*, &c. By Messrs. Sclater and Salvin its use is still further extended to include the *Ædicnemidæ*, *Parridæ*, and *Chionididæ* in addition. Lastly, Prof. Garrod used it (*P. Z. S.* 1874, p. 122, &c.) as a term for all the non-columbine "*Charadriiformes*," including in it, besides Nitzsch's groups, the Cranes, Auks, Gulls, and, presumably, the Turnicidæ, Rhinocerotidæ, Plataleidæ, and *Parridæ* as well. In fact, Garrod's restricted "family" *Charadriidæ* corresponds pretty nearly to the whole of Nitzsch's "*Limicolæ seu Scolopaciinæ*." To obviate further confusion, the term "*Limicolæ*" should be restricted to the group mentioned by Nitzsch; and I propose to substitute, as a name for the non-columbine *Charadriiformes* (the "*Limicolæ*" of Garrod) the word "*Pluviales*" to correspond with the other division, "*Columbæ*" (including the *Columbidæ* and *Pteroclidæ*), of that great group.

in his paper on the nasal bones of birds<sup>1</sup>, says that "*Parra* should be removed to the Charadriomorphæ" from the Rallidæ, on account of the schizorhinal nature of its skull, as represented in the figure of that of *Parra* (*Hydralector*) *cristata* on p. 34 of his paper. In his subsequent paper on the muscles of the thigh in birds<sup>2</sup>, *Parra* (i. e. *Metopidius*) *africana* is placed amongst the "Grallæ," with the other Charadriine or Scolopacine forms, and not included in the Rallidæ. It will be my object in the present paper to still further strengthen this latter view of the affinities of the Parridæ<sup>3</sup>.

### *Pterylosis.*

Nitzsch, in his 'Pterylography,' places *Rallus*, *Orex*, *Porphyrio*, and *Parra* as members of a group of the Fulicariæ, characterized by the narrow form of the tracts, by the presence of a distinct outer branch to the inferior tract, and by the dorsal tract being "neither interrupted nor strikingly weakened" between the shoulder-blades. He says (*l. c.* p. 126):—"The first three [genera] have *twelve* tail-feathers, and exactly the same pterylosis as that figured as occurring in *Rallus aquaticus*. In *Parra*, of which I have examined all the four principal species (*sinensis* [i. e. *Hydrophasianus chirurgus*], *ænea*, *africana*, and *jassana*), I found only *ten* tail-feathers, and a remarkable narrowing of the bands of the dorsal tract close behind the shoulder-blades; whilst, on the other hand, the hindmost, or pelvic portion of it, was dilated. This genus has also weaker lumbar tracts; and these are united with the uropygial portion of the dorsal tract by sparse contour-feathers." As Nitzsch himself later on says that the pterylosis of the "Limicolæ" closely approaches that of the Rallinæ, and is but little modified from that type, the evidence from pterylosis of the Ralline affinities of the Jaganas is not very strong. In their possession of well-marked firm rectrices, in the weakness of the lumbar tracts, and in the tendency to a division of the dorsal tract into an anterior and a posterior fork, the Parridæ differ from the typical Rallidæ, and approach the Limicoline type. The same relationship is indicated by the inner, or main, pectoral tract, though very narrow, consisting, at least at its commencement, of two or three rows of feathers in the Parridæ, as well as in the Charadriidæ; whereas in the typical Rallidæ, according to Nitzsch, it issues from the branch as only a single row of feathers.

### *Visceral Anatomy, &c.*

The tongue is long and narrow in shape, thin, and of horny consistency. Its apex is slightly notched, and its base spinulose; for the greater part of its length it is strongly concave. The œsophagus develops no crop; and the proventriculus is zonary. There

<sup>1</sup> "On the Value in Classification of a Peculiarity in the Anterior Margin of the Nasal Bones of certain Birds," P. Z. S. 1873, pp. 33-78.

<sup>2</sup> P. Z. S. 1873, pp. 626-644.

<sup>3</sup> Besides *Metopidius africanus*, Prof. Garrod dissected a specimen of *Hydrophasianus chirurgus*; and some MS. notes of his on that species I have incorporated in what follows.

is a muscular gizzard, lined by a rather thick and hard epithelium. The contents of the stomach, in one of the specimens examined, consisted of small seeds mixed with vegetable débris and small fragments of stone. The right liver-lobe is elongated, and twice as large as the left; and there is a well-developed gall-bladder. The cæca are lateral in position, and closely approximated to the intestine, which makes them difficult to see. They are mere nipples .2 inch long<sup>1</sup>. In this respect *Parra* differs from all the Rallidæ (except *Porzana notata*) which have been examined, as in all of these the cæca are long, sometimes very long. Of the Pluvialine birds, only the Plataleidæ and Rhinocetidæ, with *Sterna*, *Larus*, and one or two others, have such short cæca. The intestines measure, in these two specimens of *Parra jacana*—small intestine 12.3 and 13.2 inches, large intestine 1.1 and 1.0 inch respectively.

In *Parra jacana* and in *Hydrophasianus africanus*, as also in *Metopidius africanus*, as already recorded by Garrod<sup>2</sup>, there are two carotid arteries. This is the number found in all the Rallidæ, and in most of the Pluviales, excepting the Turnicidæ and *Arctica alle*, according to Garrod<sup>3</sup>, where there is only the left developed.

### Myology.

*Parra jacana* resembles *P. (Metopidius) africana*, as recorded by Garrod<sup>4</sup>, in possessing the ambiens, femoro-caudal, accessory femoro-caudal, semitendinosus, and accessory semitendinosus muscles, all well developed<sup>5</sup>. Their formula is therefore AB.XY<sup>6</sup>. In both these species the gluteus primus is well developed, covering the biceps superficially towards the median line; the gluteus quintus is also well developed. As in the Rallidæ, and the Gruidæ<sup>7</sup> and *Eurypyga*, amongst the Pluviales, the area of origin of the obturator internus is triangular, as it is also in *Hydrophasianus*; in the Pluvialine birds generally it is oval. The two deep flexor tendons of the foot are not at all ossified, but completely blend together some way up the leg—in *Metopidius*, in fact, just below the joint. There is no slip at all to the hallux, as was also found to be the case in *Parra africana*<sup>8</sup> and *Hydrophasianus* by Prof. Garrod. This is the more remarkable on account of the very large size of the hallux in all these birds. A special tendinous slip to that digit is very frequently present in birds which have a very insignificant hallux indeed; and I know of no other case of a bird with such a large hallux as that of the Parridæ lacking the tendon. This fact would seem to indicate that the Parridæ may have been developed from some form with a more normal-sized foot and a small hallux, which had no

<sup>1</sup> In *Hydrophasianus chirurgus* there is a strong gizzard, and the left liver-lobe is smaller than the right; the cæca measure .15 inch, the whole length of the intestines being 12 inches.—Garrod's MSS.

<sup>2</sup> P. Z. S. 1873, p. 469.

<sup>3</sup> L. c. pp. 469, 470.

<sup>4</sup> P. Z. S. 1873, p. 641.

<sup>5</sup> In *Hydrophasianus* all these five muscles are also present.

<sup>6</sup> Cf. Garrod, P. Z. S. 1874, p. 123.

<sup>7</sup> Garrod, P. Z. S. 1876, p. 199.

<sup>8</sup> P. Z. S. 1875, p. 348.

special long flexor, the great size of their feet having been developed in accordance with their peculiar habits.

In the anterior extremity the second pectoral arises from nearly the whole length of the sternum; in all three genera the third pectoral is wanting. The expansor secundariorum is strong and T-shaped, as in all Ralline and many Pluvialine birds. In *Parra jacana* (as in *Hydrophasianus*, according to Garrod) there is a distinct biceps slip to the patagium, as in all the Rallidæ, the Charadriidæ, Gruidæ, and many other Pluvialine birds. In *Metopidius africanus* it is apparently absent, the absence being probably correlated with the peculiar expanded form of the radius (to be hereafter described).

In the wing-membrane the *tensor patagii brevis* presents a peculiar arrangement, the tendon being completely divided into two portions—an inner, more slender, and an outer, stronger one. The former runs on to the fibrous tissue near the superficial origin of the *extensor metacarpi radiulis longior*, and there stops; the latter continues over this last muscle to the ulnar side of the arm, where it is lost in the fibrous covering-tissue adjacent. Before crossing, however, it sends off a short, special wristward slip to the superficial tendon of origin of the metacarpal *extensor*, as in many other groups of birds. There is also a thin fibrous expansion given off just before this to the tendon of the *tensor patagii longus*, and the tissue of the patagium generally, as in many Pluvialine birds<sup>1</sup>. This splitting up of the *tensor patagii brevis* tendon into two distinct slips, the external one in turn giving off a special wristward slip, occurs in many Pluvialine birds (*e. g.* in *Numenius arquatus*, *Totanus calidris*, *Machetes pugnax*, *Himantopus nigricollis*, *Thinocorus*, and *Attagis*), but never in the Rails, where the tendon is always much more simple, not being divided into two separate parts, or giving off a wristward slip. In fact, in most Rallidæ it runs quite simply, as a narrow straight tendon, onto the origin of the *extensor metacarpi* muscle, and there stops.

The trachea is provided with the usual pair of sterno-tracheal muscles; and the lower larynx, which is of simple structure, has also only a single pair of intrinsic muscles.

### Osteology.

From a consideration of the pterylographic, visceral, and myological features only of the Parridæ, perhaps no very definite conclusion as to their affinities could be drawn. But their osteological characters, in this case, leave no doubt as to their real position. All the skulls of Parridæ which I have examined, including those of *Parra jacana* and *gymnostoma*, *Metopidii indicus*, *africanus* and *albinucha*, and *Hydrophasianus chirurgus*, like that of *Hydralector cristata* figured by Garrod<sup>2</sup>, are strongly schizorhinal, therein differing completely from that of the Rails, and resembling that of the

<sup>1</sup> In *Hydrophasianus* much the same arrangement of the *tensor patagii brevis* obtains, to judge from a small drawing in Garrod's MS.

<sup>2</sup> P. Z. S. 1873, p. 34, fig. 5.

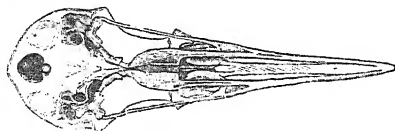


Pigeons, Plovers, and their allies (the "Charadriiformes" of Garrod<sup>1</sup>) only amongst Homalognathous birds.

There are well-developed basipterygoid processes, which are always absent in the Rails, though of very frequent occurrence amongst the "Pluviales," occurring in all the Charadriinæ and Scolopacinae I have examined.

In *Parra jacana* and *Metopidius albinucha*, the long, narrow, slightly decurved vomer is emarginate apically, as in certain Cha-

Fig. 1.



Skull of *Parra jacana*, from below; natural size.

radriidæ<sup>2</sup> (see fig. 1). In the Rallidæ it is, I believe, always sharp at the point.

The maxillo-palatine processes are rather slender and directed backwards; they have the form of concavo-convex lamellæ, are not at all swollen, and do not unite by some way in the middle line, the vomer appearing between and (when the skull is viewed from the palatal aspect) below them.

There is no ossified internasal septum, nor any ossification of the narial cartilages. The lacrymal is small, ankylosed with the nasofrontal region of the skull above, and with the "pars plana" below.

On the posterior aspect of the skull there are no traces of the occipital fontanelles, which are found in so many of the birds related to the Plovers.

The supraorbital impressions for the nasal glands, which are so conspicuous in most Plovers, the Gulls, Auks, and many other birds, are absent in the Parridæ.

The combinations depending on the presence or absence of basipterygoid processes, of occipital foramina, and of impressions on the top of the skull for the supraorbital glands, coincide, as may be seen from the following table, pretty accurately, with hardly an exception, with the chief groups of the Pluviales (the web-footed Laridæ and Alcridæ being omitted as irrelevant to our present purpose) as determined by other characters. In the Table + and - represent respectively the presence or absence of the structure indicated. In the Plataleidæ and Gruidæ the nasal glands occupy the truncated edge of the cranium above the orbits, and hardly appear on its upper surface: this condition I have indicated by the use of the double sign ( $\pm$ ).

<sup>1</sup> P. Z. S. 1874, p. 117.

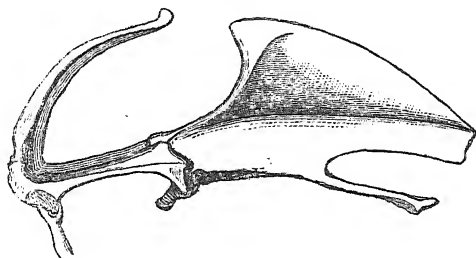
<sup>2</sup> Cf. Garrod, P. Z. S. 1877, p. 417, figs. 2-4.

	Occipital foramina.	Basiptery- goid pro- cesses.	Supraorbi- tal impres- sions.
<b>PLATALEIDÆ.</b>			
Ibis rubra.....	+	—	±
Platalea ajaja <sup>1</sup> .....	+	—	±
— leucorodia.....	+	—	±
<b>GRUIDÆ.</b>			
Grus cinerea.....	+	—	±
— americana.....	+	—	±
— australasiana.....	+	—	±
Aramus scolopaceus.....	+	—	±
<b>CHARADRIIDÆ.</b>			
Numenius arquatus.....	+	+	+
— phæopus.....	+	+	+
Recurvirostra avocetta.....	+	+	+
Tringa canutus.....	+	+	+
— cinclus.....	+	+	+
Ægialites hiaticula.....	+	+	+
Eudromias morinellus.....	+	+	+
Vanellus (cristatus?).....	+	+	+
Machetes pugnax.....	+	+	+
Hematopus ostralegus.....	+	+	+
Himantopus nigricollis.....	+	+	+
Limosa melanura.....	+	+	+
<b>PARRIDÆ.</b>			
Metopidius albinucha.....	—	+	—
— indicus.....	—	+	—
Parra jacana.....	—	+	—
Hydrophasianus chirurgus.....	—	+	—
<b>TURNICIDÆ.</b>			
Turnix lepurana.....	—	+	—
Hemipodius varius.....	—	+	—
<b>? —</b>			
Dromas ardeola <sup>2</sup> .....	—	—	+
Chionis alba.....	—	—	+
Attagis gayi.....	—	—	+
Thinocorus rumicivorus.....	—	—	+
— dorbignyanus.....	—	—	+
Cursorius gallicus.....	—	—	+
Glareola pratincola.....	—	—	+
<b>RHINOCETIDÆ.</b>			
Rhinocetus jubatus.....	—	—	—
Eurypyga helias.....	—	—	—
<b>MESITIDÆ.</b>			
Mesites unicolor <sup>3</sup> .....	—	—	—

<sup>1</sup> Sometimes ossified.<sup>2</sup> There is a perfect skeleton of this peculiar form in the Cambridge University Museum, which I have examined.<sup>3</sup> I only know the cranial characters of this bird from the plate illustrating M. Milne-Edwards's memoir (Ann. Sci. Nat. [6] vol. vii. art. no. 6).

The drawing (fig. 2) of the sternum of *Metopidius albinucha* will show how unlike it is to that of the Rallidæ. In the latter group the sternum is always peculiar in that the xiphoid processes exceed in length the body of the sternum, which tapers to a point posteriorly, and from which they are separated by very long and well-marked triangular notches. The carina sterni also is less well developed; and the clavicles are weaker and straighter, being less convex forwards, than in the Parridæ. The sternum and clavicles

Fig. 2.



Sternum and shoulder-girdle of *Metopidius albinucha*, viewed laterally; natural size.

of *Parra* and *Metopidius* in general form, on the other hand, resemble closely the type found in some of the Pluvialine birds (e. g. *Thinocorus*, *Attagis*).

The pelvis, again, of the Rails presents certain well-marked peculiarities. If that of *Rallus aquaticus* be taken as a typical form, it will be found that the ilia are long and narrow, and but little expanded in their preacetabular part. The postacetabular portion of the pelvis is but little bent down on the preacetabular part; and the ischia and pubes are but little everted. The ischia are united by broad bony plates to about the three most posterior "sacral" vertebrae; between these plates and the expanded part of the ilia above are well-developed and deep fossæ, occupied, in the fresh state, by the posterior portion of the kidneys. Viewed from above, the well-marked "postacetabular" ridge, which divides off the dorsal from the lateral aspect of the pelvis, running from just behind the antitrochanteric eminence to the posterior spine of the ilium, presents, a little behind those two points, a strongly projecting process. The greatest breadth of the postacetabular part of the pelvis is therefore here, and not at the more anteriorly-situated prominence close to the antitrochanter. Viewed from the side, this ridge forms a sort of overlapping roof to the slightly excavated external pelvic fossa. The genera *Ocydromus*, *Aramides*, *Fulica*, and *Porphyrio* do not essentially depart from this type.

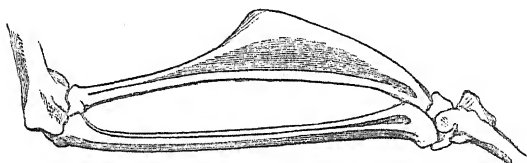
In *Parra* and *Metopidius*<sup>1</sup> the ilia are wider and more expanded

<sup>1</sup> Milne-Edwards has also described the difference of the pelvis in the Jaçanás as compared with that of the true Rallidæ: cf. 'Oiseaux Fossiles,' ii. p. 123.

anteriorly. The postacetabular ridge has hardly any median projection; and the pelvis is widest, dorsally, just behind the antitrochanters. The plates of bone between the ischia and sacrum are narrower, and the posterior part of the renal fossæ less well developed, and more open, in consequence. In all these points these forms thus approach the Limicoline birds.

There is one other point of interest in the osteology of the Parridæ. This is the extraordinary form assumed by the radius in some of the genera. In birds, as a rule, the ulna is a stouter bone than the radius, this last being almost universally a slender cylindrical bone. In *Metopidius africanus*, as already noticed by M. A. Milne-Edwards<sup>1</sup>, as well as in *M. albinucha* and in *M. indicus* (as I have been able to ascertain by extracting the wing-bones from a skin), the radius presents the form shown in the drawing (fig. 3), being dilated and

Fig. 3.



Wing-bones of *Metopidius albinucha*, to show the peculiarly modified radius; natural size.

flattened into a subtriangular lamellar-like expansion for its distal half. Its superior surface is slightly grooved posteriorly for the tendon of the *extensor metacarpi radialis longior* muscle.

This dilated portion forms the margin of the patagial space for its distal portion. A considerable portion of the marginal tendon of the *tensor patagii longus* is inserted into the radius at the angle of the bone; the main tendon, however, continues in a groove on the inferior aspect of that bone, a little behind the border, to its ordinary insertion. About half of the peculiar flattened radius is left bare of muscle above, the *extensor metacarpi*, as already stated, playing over its lower half. Below, the flattened area is largely covered by the fibres of the *pronator radii superficialis*, which extend up nearly to the margin of the bone; below this is the *pronator radii profundus*, which likewise has an extensive insertion into the lower part of the bone. The margin of the bone, where it is superficial, is slightly roughened; and no doubt the peculiar form of radius is associated with the quarrelsome habits of these birds, this dilated and somewhat scimitar-shaped bone being probably capable of inflicting a very severe downward blow.

In *Parra jacana* and *P. gymnostoma* the radius presents the ordinary form; and the same is the case in *Hydrophasianus chirurgus*.

In these two genera, it is to be observed, the metacarpal "spur"

<sup>1</sup> 'Oiseaux Fossiles,' ii. p. 134.

is much more developed and sharp than in the species of *Metopidius*, where it is small and blunt; so that there is a correlation apparently between a sharp spur and a simple radius, and a blunt spur and flattened radius. In *Hydralector gallinacea* there is a blunt spur, with, so far as I can make out from a skin, a flattened radius.

The "claw" or "spur" of the wing of the Jaçanás has, it may be observed, no relation whatever to the "claw" or nail of the pollex, which is also present, though small, in all the three genera I have examined. The "spur," in *Parra jacana* at least, consists of an external, translucent, yellow epidermic layer, which invests a central core of compact fibrous tissue, this in turn being supported by a bony projection developed at the radial side of the first metacarpal.

As regards the position of the Parridæ in the group Pluviales, it appears to me that they form a well-marked family, with no very obvious relationships to any of the other families of that group, approaching, however, perhaps most nearly to the Charadriidæ, from which they are easily distinguishable by the absence of supraorbital glands and occipital foramina, by their enormously elongated toes, by the number of rectrices, and other points. A brief definition of the Parridæ may be given as follows:—

Charadriiform birds, with ten rectrices, short cæca, and a tufted oil-gland; with the ambiens, accessory femoro-caudal, and accessory semitendinosus muscles developed, and with the obturator internus triangular; with a two-notched sternum, and with the digits, including the hallux, greatly developed; with the skull provided with basipterygoid processes, but lacking occipital foramina and supra-orbital gland-impressions.

#### 4. Description d'une nouvelle Belette du Pérou septentrional.

Par L. TACZANOWSKI, C.M.Z.S.

[Received April 20, 1881.]

##### MUSTELA JELSKII, n. sp.

*Minor, castaneo-brunnea, capite obscuriore; subtus isabellina; pedes corpori concolores; cauda corpore paulo brevior, apice nigra; mystacibus longissimis.*

*Hab.* Peruvia bor. orient.

Un exemplaire d'une Belette pris par M. Jelski à Cutervo, au nord-est du Pérou, et déposé au Musée de Varsovie, voisin de la *M. macroura*, mais beaucoup plus petit, n'atteignant pas les dimensions de la *M. erminea* d'Europe, me semble appartenir à une forme inédite. Cet individu me paraît être adulte, car ses dents sont fort usées et le squelette fort durci.

La couleur générale est brune avec une nuance marron plus faible que dans la *M. macroura*, à tête distinctement plus foncée; celle de la moitié basale de la queue est analogue à celle du corps, passant ensuite en une légère teinte distinctement plus jaunâtre, l'extrémité même est d'un noir brunâtre sur l'espace d'un pouce et demi. Les

oreilles garnies de poils de la même couleur que les parties environnantes de la tête. Tout le dessous, en commençant du menton, ainsi qu'une bande sur le côté interne des pattes antérieures, n'atteignant pas leur extrémité, et une large bande sur la moitié antérieure du devant de la cuisse sont d'une couleur isabelle, blanchâtre sur le menton et le haut de la gorge et plus jaune sur le reste. Les pattes sont de la même nuance que le corps. Le poil est gris dans la moitié basale, d'une nuance plus pâle que celle dans la *M. macroura*, sans anneau médian. Les ongles blanchâtres.

Longueur depuis le nez jusqu'à la naissance de la queue 203, de la queue avec le poil 150, queue sans poil 120, de la tête 77, du tarse jusqu'au bout des ongles 37 millim.

La tête de cette Belette est proportionnellement un peu plus courte que dans la *M. macroura*, et beaucoup moins longue que dans la *M. erminea*. Sa queue est presque également velue dans toute sa longueur et terminée en pointe obtuse. Ses canines sont relativement beaucoup plus épaisses que celles de la *M. macroura*; les ongles des pattes antérieures beaucoup plus courts et beaucoup plus élevés à la base; elle se distingue principalement de cette dernière espèce par la longueur des moustaches, qui dépassent de plus de vingt millimètres le bord postérieur de l'oreille, tandis que dans la Belette citée les cils les plus longs le dépassent de très peu. La couleur générale diffère en ce dans les deux espèces, que le brun dans cette petite forme ne présente pas de nuance jaune-marron, caractéristique dans la grande.

L'individu de cette nouvelle espèce a le cou et le devant du dos parsemé de quelques poils blancs, une mèche de cette couleur au front et quelques poils çà et là sur les autres parties foncées du corps, ce qui indique une certaine tendance au changement de la couleur.

Outre les deux espèces péruviennes à longue queue, M. Stolzmann a fourni de Tambillo deux peaux d'une troisième forme. Cette Belette est à queue beaucoup plus courte et s'applique parfaitement à la description de la *M. agilis*, Tsch., ne présentant qu'un seul détail de la coloration qui n'est pas d'accord, c'est à dire que le dessous du corps n'est pas gris comme le dit Tschudi, mais fauve roussâtre comme celui dans la *M. frenata* de Californie, à laquelle ressemble aussi l'exemplaire adulte par le collier blanchâtre également disposé devant les oreilles, quelques poils blancs épars au milieu du front à la place de la tache caractéristique de cette dernière espèce, et la couleur jaune claire étendue jusqu'à l'extrémité des pattes antérieures. Au premier coup d'œil cet exemplaire ressemble à la *M. frenata*, mais cette dernière a la conque auriculaire beaucoup plus développée. Je suppose donc que c'est plutôt la *M. agilis* de Tschudi, qui dit que l'animal varie beaucoup dans sa coloration.

L'autre exemplaire de la même localité, beaucoup plus petit, probablement jeune, est sur tout le dessus du corps d'une couleur beaucoup plus pâle que dans l'adulte, et uniforme partout, excepté l'extrémité de la queue, qui est plus foncée, sans taches claires sur la tête et sans aucune trace de collier; la nuance de ses parties infé-

rieures du corps est beaucoup moins jaunâtre. Dans l'adulte et dans le jeune les plus longues moustaches n'atteignent pas l'oreille.

Monsieur Stolzmann annonce dans sa dernière lettre la capture d'une Belette différente de toutes ces espèces, plus grande que la *M. macroura* et distincte par quelques détails de la coloration, ce qui confirme l'opinion de M. Tschudi, exprimée dans sa 'Fauna Peruana,' sur l'existence de plusieurs espèces de cet genre dans les Andes de l'Amérique méridionale.

5. On the Hymenoptera collected by Prof. I. Bayley Balfour in Socotra. By W. F. KIRBY, Assistant in the Zoological Department, British Museum.

[Received April 23, 1881.]

The small collection of insects lately made in Socotra by Prof. Balfour, and deposited in the British Museum, contained only six specimens of Hymenoptera, belonging to four species. Of these, two are apparently new to science, and the others are well-known and wide-ranging species, the occurrence of which in the island is in nowise remarkable.

I proceed to enumerate the species as follows :—

#### APIDÆ.

##### 1. XYLOCOPA ÆSTUANS.

*Apis æstuans*, Linn. Syst. Nat. i. p. 579. no. 37 (1758).

A well-known and widely distributed East-Indian species.

#### VESPIDÆ.

##### 2. BELENOGASTER SAUSSUREI, sp. n.

Exp. al.  $1\frac{1}{2}$  in. ; long. corp. 11 lines.

Not closely allied to any known species.

Head, antennæ, prothorax, scutellum, postscutellum, legs, and abdomen of a lively chestnut colour; meso- and metathorax, sides of pectus, and segments 2 and 3 of the abdomen black. The prothorax is indistinctly and narrowly bordered with yellowish; and the mouth-parts are more or less yellow in the male. The first segment of the abdomen is distinctly bordered behind with yellow, most broadly on the upper part of the sides. The thorax, scutellum, &c. are finely punctured; and there are three very shallow longitudinal grooves on the mesothorax, and a more distinct groove in the middle of the metathorax. Wings smoky brown, with iridescent reflections; nervures brown or reddish brown; yellowish towards the base and along the costa and inner margin of the fore wings.

#### POMPIDÆ.

##### 3. MYGNIMIA EXTRANEA, sp. n.

Exp. al. 2 in. 1 line to 2 in. 6 lines; long. corp. 1 in. to 1 in. 5 lines.

Allied to *M. vindex*, Smith, from S. Africa, and *M. prodigiosa*, Gerst., from E. Africa.

*Male*. Head, antennæ, prothorax, and legs reddish, a very narrow bright red line round the eyes, and the mouth also shading into bright red; mesothorax black above, with three carinæ in front, and a broad raised ridge behind; scutellum deeply incised; metathorax oval, truncated behind, and clothed with long hair. Pectus and abdomen clothed with a coppery green pile; the middle of the pectus with a few long grey hairs. Wings deep purple or violet, with blue and green reflections.

*Female*. Similar, but with the red colouring less marked, especially on the head and prothorax.

#### SPHEGIDÆ.

##### 4. PELOPCEUS ÆGYPTIUS.

*Sphex ægyptiæ*, Linn. Syst. Nat. i. p. 569, no. 4 (1758).

*Sphex spirifex*, Linn. loc. cit. p. 570. no. 8.

A common species in South Europe, and apparently spread over nearly the whole of Africa.

##### 6. On the Range of *Apogon ellioti*. By FRANCIS DAY, F.Z.S.

[Received April 29, 1881.]

*Apogon nigripinnis*, Günther, Catal. i. 1859, p. 235; Playfair, Fish. Zanzibar, 1866, p. 20 (not Cuv. & Val. ii. p. 152).

*A. ellioti*, Day, Fishes of India, part. i. 1875, p. 63, pl. xvii. fig. 1.

*A. arafuræ*, n. sp., Günther, Shore Fishes of 'Challenger,' 1880, p. 38, pl. xvi. fig. c.

Among the littoral forms of fishes collected by the 'Challenger' are some which appear to me to have a much wider range than is adverted to in the late interesting contribution to our ichthyological knowledge. Having been in London last week, I took the opportunity of re-examining the forms in the national Museum recorded as *A. nigripinnis*, and likewise the fine single example of *A. arafuræ* brought home by the Expedition from the Arafura Sea.

I would premise that, having had the opportunity of comparing the example at the Jardin des Plantes, said to be the type of *A. nigripinnis*, C. V., with the one I figured in the 'Fishes of India,' pl. xvi. fig. 6, I feel confident of their being identical. I also think that there can exist but little reasonable doubt that most of the specimens named *A. nigripinnis* in the British Museum are young examples of *A. ellioti*. They were received from Zanzibar, the East Indies, and China.

When I published the 'Fishes of India,' I only possessed two examples from India. Since that time, owing to the kindness of Dr.



Keess and others, I have received several more from Madras, and am consequently able to distribute them among various European museums.

The example of *A. arafura* still shows the faint vertical bands which are so much better seen in the immature. The dorsal spines are damaged; and the fish has its mouth distended, in which position it has become permanently fixed, owing probably to having been put into rather strong spirit soon after its capture.

*Apogon ellioti* is one of those shore forms which extend through the Indian Ocean from the east coast of Africa to the Malay archipelago and China, likewise to the Arafura Sea on the coast of New Guinea. It is rather remarkable that Dr. Bleeker did not obtain it; he had one from my collection, and informed me that it was new to him.

June 7, 1881.

Professor Flower, LL.D., F.R.S., President, in the Chair.

The Secretary called the attention of the Meeting to the opening of the Insectarium in the Society's Gardens, which had taken place on the 25th of April last; and remarked, that although of late years many entomologists had been in the habit of rearing insects in captivity for the purpose of watching their transformations and obtaining good specimens in each stage of existence, nothing like a systematic attempt, so far as he knew, had been previously made to form a general collection of living insects for exhibition. As in former days as regards reptiles and the lower marine animals, so in the present instance as regards its Insectarium, the Society seemed to be first in the field, and, so far as could be judged from the progress already made, to be likely, if not altogether successful, to attain many interesting and instructive results.

The building in the Gardens now used as an Insectarium was constructed of iron and glass on three sides, with a brick back to it, and formerly formed part of the refreshment buildings. It had been moved to its present site, on the north bank of the canal near the north entrance, last autumn, and had been used during the winter as a nursery for delicate monkeys and tropical birds. The cases containing the insects, to which it was now devoted, were arranged on stands all round the building, and also occupied two tables in the centre. The cases used for the principal specimens were formed of zinc plates. The upper part of them was glazed on all four sides, the top being formed of perforated zinc so as to admit the air. The food-plant or object required for the suspension of the chrysalises, when that stage of the insect was exhibited, was inserted into the case through a circular hole in the bottom; but the glass front also opened, so that ready access could be obtained to the interior. The larger cases in the front row measured about 24 inches in breadth by 18 in depth, and were 32 inches in height.

The cases in the opposite row were of similar construction, but rather smaller in dimensions.

The cases on the south side (on each side of the entrance door) have been mostly appropriated to the exhibition of the larger and finer species of silk-producing moths of the family Bombycidae. Amongst them might be specially noticed Glover's Silk-moth (*Samia gloveri*) and the Cecropian Silk-moth (*S. cecropia*) of North America, Perny's Silk-moth (*Attacus pernyi*) of Northern China, the Tusseh Silk-moth (*A. mylitta*) of India, and the great Emperor Moth (*Saturnia pyri*) of Europe.

On the north side of the Insectarium the smaller cases were devoted principally to the rarer and more noticeable moths and butterflies of Europe, such as the Swallow-tailed Butterfly (*Papilio machaon*), the Black-veined Butterfly (*Aporia crataegi*), the Purple Emperor (*Apatura iris*), and the Orange-tip (*Anthocharis cardamines*), among the former, and the Scarlet Tiger-moth (*Callimorpha dominula*) and Emperor Moth (*Saturnia carpinii*), among the latter group. The series was continued, mixed with other forms, at the east end of the building. On the large tables in the middle of the Insectarium were examples of other butterflies, moths, beetles, mayflies, stoneflies, and aquatic insects of different kinds. The whole series exhibited now contained examples of about fifty species; but daily additions were made to it.

Finally, the Secretary observed, every specimen in the Insectarium was distinctly labelled, and that over each of the principal cases was fixed a glazed box, in which was placed preserved specimens of the various stages of metamorphosis of the insect exhibited in the case beneath.

The Insectarium had been placed under the sole charge of Mr. William Watkins, an experienced entomologist and breeder of insects, whose name was well known to many naturalists. Mr. Watkins, whose services had been secured for the Society for the purpose of inaugurating this interesting exhibition, had prepared the subjoined Report on the insects already bred and exhibited under his charge.

*Report on the Insects exhibited in the Insectarium during the month of May 1881.*

1. EXOTIC LEPIDOPTERA.

*Samia gloveri*.—Specimens of this species emerged almost daily through the month; and fertile eggs were obtained, which hatched on the 12th instant. The larvæ when hatched are a shining black, with numerous spines of the same colour; after the first change, which took place in six days, they assume a yellowish colour; at the second moult they become green with paler-coloured spines, each tipped with bright red. A choice of many shrubs were given them, but although they ate plum and sawlow they left these for gooseberry, which they are now thriving well upon.

*Samia cecropia*.—This species emerged through the month, and

copulation was frequent; a large number of eggs were obtained, but many are not fertile, perhaps owing to the stock already having been interbred. Young larvæ hatched on the 14th instant, and are growing well. Food-plant Plum.

*Attacus cynthia*.—This species commenced to emerge towards the end of the month, but only 4 specimens have yet appeared. It is usually the latest species of all.

*Attacus pernyi*.—Perfect insects of this species were on view throughout the month. Fertile eggs obtained, which commenced to hatch 30th instant, and are doing well. Food-plant Oak.

*Attacus mylitta*.—This species commenced to emerge on 28th instant, a beautiful male being bred; on the following day a male and female emerged, the first male was therefore preserved. Eggs obtained, which are probably fertile.

*Attacus atlas*.—Throughout the latter half of the month specimens of this species have emerged, and many fine ones are preserved. Eggs will probably be obtained later; many more still to come out.

*Actias selene*.—The first specimen of this species emerged on the last day of the month.

*Actias luna*.—During the early part of the month specimens of this species emerged. Eggs have been obtained, but it is doubtful if they are fertile.

*Telea promethæa*.—The cocoons of this species have as yet only produced a large Ichneumon-fly (*Ophion*, sp. inc.). Many visitors have evinced great interest on seeing these large parasites in the cage produced from perfectly-formed Lepidopterous cocoons externally, and internally a stout well-made oval cocoon of the Hymenoptera.

*Anthæra yama-mai*.—The larvæ of this species produced from eggs have done fairly well; many are now nearly full fed and about to spin. Food-plant Oak.

#### BRITISH LEPIDOPTERA.

##### *Rhopalocera.*

*Papilio machaon*.—Imagines of this species have been on view almost daily throughout the month.

*Anthocharis cardamines*.—During the first half of the month imagines of this species were bred.

*Aporia cratægi*.—Small larvæ of this species were obtained and fed up, producing the first imagines 27th instant. The three stages of larva, pupa, and imago are now exhibited.

*Apatura iris*.—This species has unfortunately not done well. I was unable to detect them in the act; but the numbers slowly diminished, and I am led to the conclusion that the larvæ are cannibals. On several occasions I observed them worrying each other. Only 2 out of 24 larvæ have been saved; the first of these is now a pupa, the other feeding up. There were 6 larvæ found dead.

*Limenitis sibylla*.—This species was bred from small larvæ obtained from the New Forest and Germany; and the three stages were on view during the last ten days of the month.

*Melitæa cinxia*.—Imagines of this species were bred from larvæ during the month; and perfect insects were on view nearly the whole month through.

*Nemeobius lucina*.—Imagines of this species emerged from pupæ during the month.

#### *Heterocera.*

*Chelonia caja*.—Larvæ of this species attained a fine size, and produced large imagines, commencing to emerge at the latter end of the month.

*Chelonia villica*.—The larvæ of this species spun up during the early part of the month; and many fine imagines have been produced during the last ten days of the month.

*Callimorpha dominula*.—Larvæ and pupæ of this species were on exhibition during first half of the month, and imagines during last half. The species fed up well, and produced full-sized imagines.

*Odonestis potatoria*.—This species fed very slowly during the month. Cocoons were formed towards the latter end.

*Orygia gonostigma*.—The handsome larvæ of this species were exhibited during the earlier part of the month, and some females (apterous) bred and exhibited.

*Lasiocampa quercifolia*.—The larvæ of this species fed up well, and produced full-sized cocoons towards the end of the month.

*Saturnia carpi*.—Larvæ of this species hatched from eggs obtained May 24. Food-plant Plum.

*Bombyx neustria*.—A colony of these larvæ were obtained small, and have fed up well, many cocoons being in the cage at end of the month.

*Cossus ligniperda*.—A piece of the branch of a willow-tree much bored, and containing larvæ of this species, was exhibited from the 28th instant.

*Catocala fraxini*.—The larvæ of this species obtained from eggs grew well till they were nearly an inch long, when they refused food and gradually died off. A second batch retained in my studio were then placed in the Insectarium; and these likewise died. I think they were hatched too early.

*Catocala sponsa*.—Young larvæ of this species obtained from eggs did not do well, gradually dying off. I retained a few in my studio, and put them in the Insectarium when an inch long; and they rapidly fed up, and are nearly full-fed.

*Uropteryx sambucata*.—The stick-like larvæ of this species were very interesting when visitors could distinguish them from the twigs of hawthorn upon which they were feeding.

#### EUROPEAN RHOPALOCERA.

*Apatura ilia*.—Two larvæ of this species obtained from Germany. Both are now full-fed and about changing.

*Melitæa maturna*.—Imagines of this species were bred from larvæ sent from Germany.

## EUROPEAN HETEROCERA.

*Heterogynis penella*.—A batch of freshly-hatched larvæ were presented by Lord Walsingham on the 23rd instant. The larvæ are growing slowly, and feed upon the cultivated yellow-flowering *Genista*, drilling regular little round holes in the leaves.

## BRITISH HYMENOPTERA.

A piece of heather containing three cocoons of the Sand-Wasp (*Pelopæus*, sp. inc.) were presented to the Society by Col. Irby, F.Z.S., and produced two imagines 23rd and 24th instant.

## BRITISH NEUROPTERA.

The larvæ of *Libellula depressa* have done well; but those of *Agriön*, sp. inc., have all died. It is probable that these species require running water of a temperature not above 50°. *Ephemera*, sp. inc., grew well, and produced two imagines.

## EUROPEAN NEUROPTERA.

*Myrmeleon formicarius*.—Fifteen larvæ of this insect were obtained from France, and have established themselves in some sand in a glass shade, exhibiting their pits as in a wild state.

## BRITISH COLEOPTERA.

Imagines of *Dytiscus marginalis*, *Hydrophilus piceus*, and *Cicindela campestris* exhibited. One larva of *Dytiscus marginalis* was exhibited for half the month, when it was attacked by a species of fungus and died.

## BRITISH TRICHOPTERA.

Caddis-flies (*Phryganea*, sp. inc.).—These have lived, and many are probably mere pupæ.

## EXOTIC ORTHOPTERA.

Eggs of 5 species of Leaf-insects were received from Mr. Waterhouse, British Museum, and are exhibited in a suitable vessel should they hatch.

There have also been exhibited :—

## BRITISH HEMIPTERA.

*Notonecta glauca*, and eggs obtained, which hatched and attained half growth.

*Nepa cinerea*; and

Aquatic Spiders (ARACHNIDA).

## GENERAL REMARKS.

I have not been able to add a number of species that I should have wished, owing to a severe illness, which suddenly attacked me on the 14th instant.

The imagines that have emerged have nearly all been fine and perfect, a very small percentage indeed of deformed insects coming out; and as a rule the house is well adapted, in my opinion, for any exotic species and most of the British, the latter emerging much earlier than would be the case in their wild state; but there is no apparent diminution in size, speaking from imagines obtained from small larvæ, as is frequently the case with larvæ bred in confinement.

June 6, 1881.

WM. WATKINS.

The following papers were read :—

1. On the Development of the Skeleton of the Paired Fins of Elasmobranchii, considered in Relation to its Bearings on the Nature of the Limbs of the Vertebrata. By F. M. BALFOUR, F.R.S., F.Z.S., Fellow of Trinity College, Cambridge.

[Received June 2, 1881.]

(Plates LVII., LVIII.)

Some years ago the study of the development of the soft parts of the fins in several Elasmobranch types, more especially in *Torpedo*, led me to the conclusion that the vertebrate limbs were remnants of two continuous lateral fins<sup>1</sup>. More or less similar views (which I was not at that time acquainted with) had been previously held by MacIise, Humphrey, and other anatomists; these views had not, however, met with much acceptance, and diverge in very important points from those put forward by me. Shortly after the appearance of my paper, J. Thacker published two interesting memoirs comparing the skeletal parts of the paired and unpaired fins<sup>2</sup>.

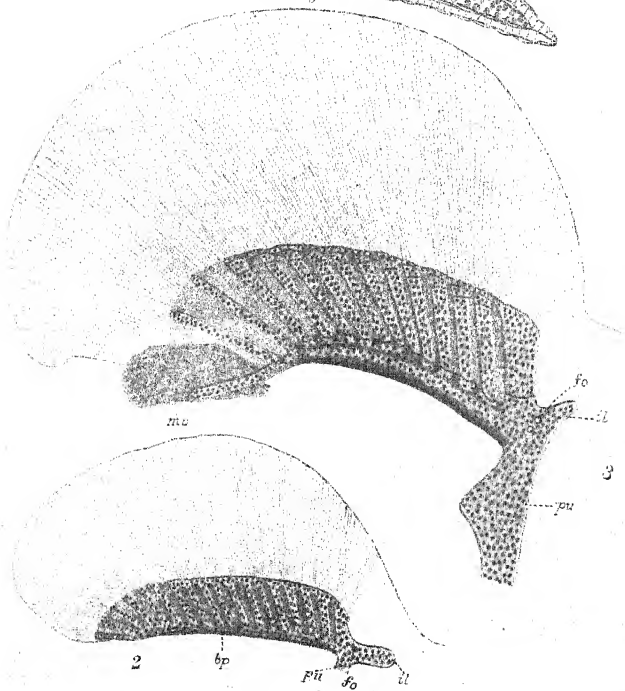
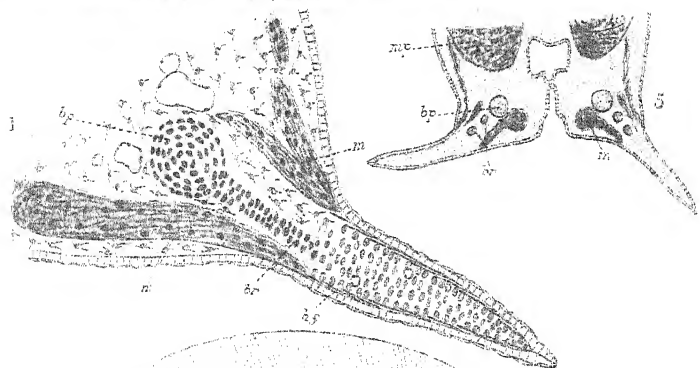
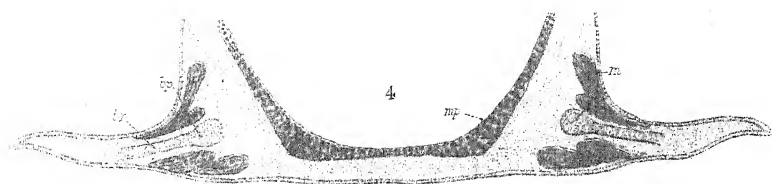
In these memoirs Thacker arrives at conclusions as to the nature of the fins in the main similar to mine, but on entirely independent grounds. He attempts to show that the structure of the skeleton of paired fins is essentially the same as that of the unpaired fins, and in this comparison lays special stress on the very simple skeleton of the pelvic fin in the cartilaginous Ganoids, more especially in *Acipenser* and *Polyodon*. He points out that the skeleton of the pelvic fin of *Polyodon* consists essentially of a series of nearly isolated rays, which have a strikingly similar arrangement to that of the rays of the skeleton in many unpaired fins. He sums up his views in the following way<sup>3</sup> :—

<sup>1</sup> Monograph on the Development of Elasmobranch Fishes, pp. 101, 102.

<sup>2</sup> J. K. Thacker, "Median and Paired Fins, a Contribution to the History of the Vertebrate Limbs," Trans. of the Connecticut Acad. vol. iii. 1877.

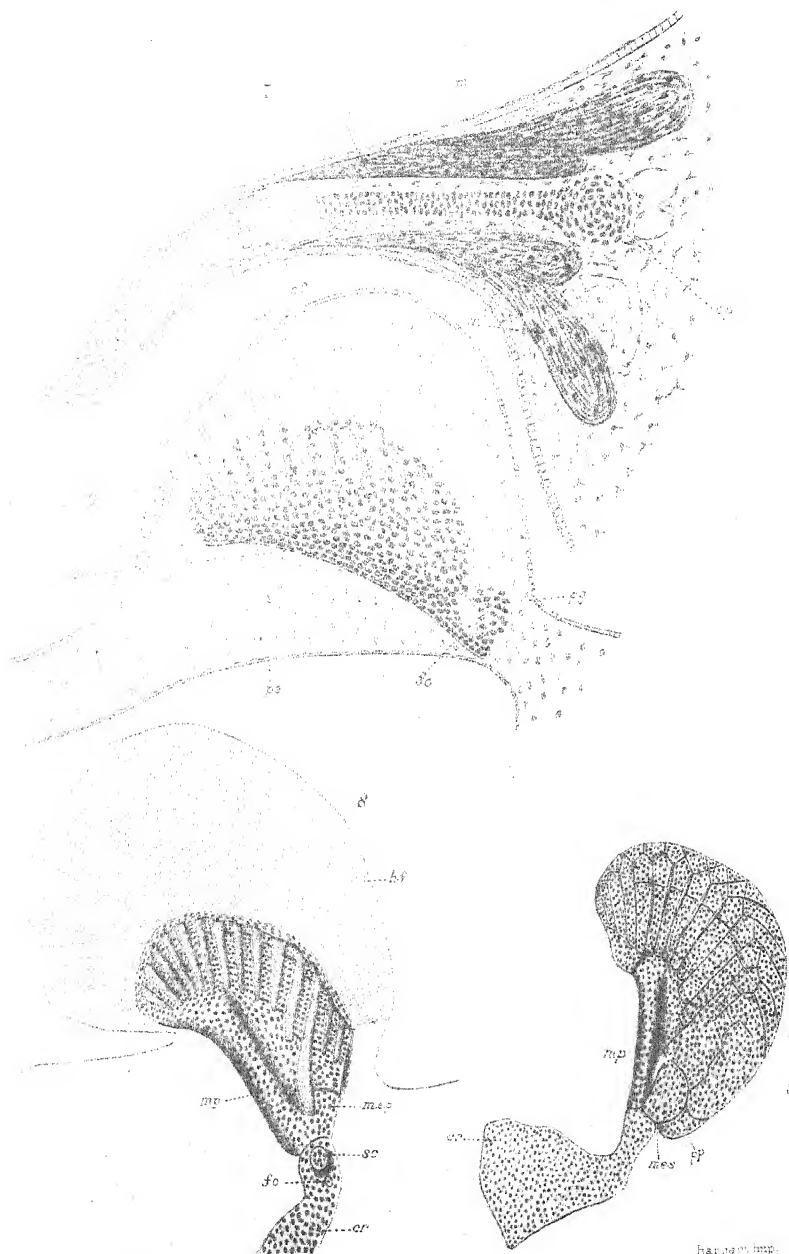
J. K. Thacker, "Ventral Fins of Ganoids," Trans. of the Connecticut Acad. vol. iv. 1877.

<sup>3</sup> *Loc. cit.* p. 298.











"As the dorsal and anal fins were specializations of the median folds of *Amphioxus*, so the paired fins were specializations of the two lateral folds which are supplementary to the median in completing the circuit of the body. These lateral folds, then, are the homologues of Wolffian ridges, in embryos of higher forms. Here, as in the median fins, there were formed chondroid and finally cartilaginous rods. These became at least twice segmented. The orad ones, with more or less concrescence proximally, were prolonged inwards. The cartilages spreading met in the middle line; and a later extension of the cartilages dorsad completed the limb-girdle.

"The limbs of the Protognathostomi consisted of a series of parallel articulated cartilaginous rays. They may have coalesced somewhat proximally and orad. In the ventral pair they had extended themselves mesiad until they had nearly or quite met and formed the hip-girdle; they had not here extended themselves dorsad. In the pectoral limb the same state of things prevailed, but was carried a step further, namely, by the dorsal extension of the cartilage constituting the scapular portion, thus more nearly forming a ring or girdle."

The most important point in Thacker's theories which I cannot accept is the derivation of the folds, of which the paired fins of the Vertebrata are supposed to be specializations, from the lateral folds of *Amphioxus*; and Thacker himself recognizes that this part of his theory stands on quite a different footing to the remainder.

Not long after the publication of Thacker's paper, an important memoir was published by Mivart in the 'Transactions' of this Society<sup>1</sup>. The object of the researches recorded in this paper was, as Mivart explains, to test how far the hard parts of the limbs and of the azygos fins may have arisen through centripetal chondrifications or calcifications, and so be genetically exoskeletal<sup>2</sup>.

Mivart's investigations and the majority of his views were independent of Thacker's memoir; but he acknowledges that he has derived from Thacker the view that pelvic and pectoral girdles, as well as the skeleton of the limbs, may have arisen independently of the axial skeleton.

The descriptive part of Mivart's paper contains an account of the structure of a great variety of interesting and undescribed types of paired and unpaired fins, mainly of Elasmobranchii. The following is the summary given by Mivart of the conclusions at which he has arrived<sup>3</sup>:—

"1. Two continuous lateral longitudinal folds were developed, similar to dorsal and ventral median longitudinal folds.

"2. Separate narrow solid supports (radials), in longitudinal series, and with their long axes directed more or less outwards at right

<sup>1</sup> St. George Mivart, "On the Fins of Elasmobranchii," Zoological Trans. vol. x.

<sup>2</sup> Mivart used the term exoskeletal in an unusual and (as it appears to me) inconvenient manner. The term is usually applied to dermal skeletal structures; but the skeleton of the limbs, with which we are here concerned, is undoubtedly not of this nature.

<sup>3</sup> *Loc. cit.* p. 480.

angles with the long axis of the body, were developed in varying extents in all these four longitudinal folds.

"3. The longitudinal folds became interrupted variously, but so as to form two prominences on each side, *i. e.* the primitive paired limbs.

"4. Each anterior paired limb increased in size more rapidly than the posterior limb.

"5. The bases of the cartilaginous supports coalesced as was needed, according to the respective practical needs of the different separate portions of the longitudinal folds, *i. e.* the respective needs of the several fins.

"6. Occasionally the dorsal radials coalesced (as in *Notidanus* &c.) and sought centripetally (*Pristis* &c.) adherence to the skeletal axis.

"7. The radials of the hinder paired limb did so more constantly, and ultimately prolonged themselves inwards by mesiad growth from their coalesced base, till the piscine pelvic structure arose, as, *e. g.*, in *Squatina*.

"8. The pectoral radials with increasing development also coalesced proximally, and thence prolonging themselves inwards to seek a *point d'appui*, shot dorsad and ventrad to obtain a firm support, and at the same time to avoid the visceral cavity. Thus they came to abut dorsally against the axial skeleton, and to meet ventrally together in the middle line below.

"9. The lateral fins, as they were applied to support the body on the ground, became elongated, segmented, and narrowed, so that probably the line of the propterygium, or possibly that of the mesopterygium, became the cheiropterygial axis.

"10. The distal end of the incipient cheiropterygium either preserved and enlarged preexisting cartilages or developed fresh ones to serve fresh needs, and so grew into the developed cheiropterygium; but there is not yet enough evidence to determine what was the precise course of this transformation.

"11. The pelvic limb acquired a solid connexion with the axial skeleton (a pelvic girdle) through its need of a *point d'appui* as a locomotive organ on land.

"12. The pelvic limb became also elongated; and when its function was quite similar to that of the pectoral limb, its structure became also quite similar (*e. g.* *Ichthyosaurus*, *Plesiosaurus*, *Chelydra*, &c.); but for the ordinary quadrupedal mode of progression it became segmented and inflected in a way generally parallel with, but (from its mode of use) in part inversely to, the inflections of the pectoral limb."

Günther<sup>1</sup> has propounded a theory on the primitive character of the fins, which, on the whole, fits in with the view that the paired fins are structures of the same nature as the unpaired fins. The interest of Günther's views on the nature of the skeleton of the fins more especially depends upon the fact that he attempts to evolve the fin

<sup>1</sup> "Description of *Ceratodus*," Phil. Trans. 1871.

of *Ceratodus* from the typical Selachian type of pectoral fin. His own statement on this subject is as follows<sup>1</sup>:—

“On further inquiry into the more distant relations of the *Ceratodus*-limb, we may perhaps be justified in recognizing in it a modification of the typical form of the Selachian pectoral fin. Leaving aside the usual treble division of the carpal cartilage (which, indeed, is sometimes simple), we find that this shovel-like carpal forms the base for a great number of phalanges, which are arranged in more or less regular transverse rows (zones) and in longitudinal rows (series). The number of phalanges of the zones and series varies according to the species and the form of the fin; in *Oestracion philippi* the greater number of phalanges is found in the proximal zones and middle series, all the phalanges decreasing in size from the base of the fin towards the margins. In a Selachian with a long, pointed, scythe-shaped pectoral fin, like that of *Ceratodus*, we may, from analogy, presume that the arrangement of the cartilages might be somewhat like that shown in the accompanying diagram, which I have divided into nine zones and fifteen series.

“When we now detach the outermost phalanx from each side of the first horizontal zone, and with it the other phalanges of the same series, when we allow the remaining phalanges of this zone to coalesce into one piece (as, in nature, we find coalesced the carpals of *Ceratodus* and many phalanges in Selachian fins), and when we repeat this same process with the following zones and outer series, we arrive at an arrangement identical with what we actually find in *Ceratodus*.”

While the researches of Thacker and Mivart are strongly confirmatory of the view at which I had arrived with reference to the nature of the paired fins, other hypotheses as to the nature of the skeleton of the fins have been enunciated, both before and after the publication of my memoir, which are either directly or indirectly opposed to my view.

Huxley in his memoir on *Ceratodus*, which throws light on so many important morphological problems, has dealt with the nature of paired fins<sup>2</sup>.

He holds, in accordance with a view previously adopted by Gegenbaur, that the limb of *Ceratodus* “presents us with the nearest known approximation to the fundamental form of vertebrate limb or archipterygium,” and is of opinion that in a still more archaic fish than *Ceratodus* the skeleton of the fin “would be made up of homologous segments, which might be termed pteromeres, each of which would consist of a mesomere with a preaxial and a postaxial paramere.” He considers that the pectoral fins of Elasmobranchii, more especially the fin of *Notidanas*, which he holds to be the most primitive form of Elasmobranch fin, “results in the simplest possible manner from the shortening of the axis of such a fin-skeleton as that of *Ceratodus*, and the coalescence of some of its elements.” Huxley

<sup>1</sup> *Loc. cit.* p. 534.

<sup>2</sup> T. H. Huxley, “On *Ceratodus Fosteri*, with some Observations on the Classification of Fishes,” *Proc. Zool. Soc.* 1876.

does not enter into the question of the origin of the skeleton of the pelvic fin of Elasmobranchii.

It will be seen that Huxley's idea of the primitive structure of the archipterygium is not easily reconcilable with the view that the paired fins are parts of a once continuous lateral fin, in that the skeleton of such a lateral fin, if it has existed, must necessarily have consisted of a series of parallel rays.

Gegenbaur<sup>1</sup> has done more than any other living anatomist to elucidate the nature of the fins; and his views on this subject have undergone considerable changes in the course of his investigations. After Günther had worked out the structure of the fin of *Ceratodus*, Gegenbaur suggested that it constituted the most primitive *persisting* type of fin, and has moreover formed a theory as to the origin of the fins founded on this view, to the effect that the fins, together with their respective girdles, are to be derived from visceral arches with their rays.

His views on this subject are clearly explained in the subjoined passages quoted from the English translation of his 'Elements of Comparative Anatomy,' pp. 473 and 477.

"The skeleton of the free appendage is attached to the extremity of the girdle. When simplest, this is made up of cartilaginous rods (rays), which differ in their size, segmentation, and relation to one another. One of these rays is larger than the rest, and has a number of other rays attached to its sides. I have given the name of *archipterygium* to the ground-form of the skeleton which extends from the limb-bearing girdle into the free appendage. The primary ray is the stem of this archipterygium, the characters of which enable us to follow out the lines of development of the skeleton of the appendage. Cartilaginous arches beset with the rays form the branchial skeleton. The form of skeleton of the appendages may be compared with them; and we are led to the conclusion that it is possible that they may have been derived from such forms. In the branchial skeleton of the Selachii the cartilaginous bars are beset with simple rays. In many a median one is developed to a greater size. As the surrounding rays become smaller, and approach the larger one, we get an intermediate step towards that arrangement in which the larger median ray carries a few smaller ones. This differentiation of one ray, which is thereby raised to a higher grade, may be connected with the primitive form of the appendicular skeleton; and as we compare the girdle with a branchial arch, so we may compare the median ray and its secondary investment of rays with the skeleton of the free appendage.

"All the varied forms which the skeleton of the free appendages

<sup>1</sup> C. Gegenbaur, 'Untersuchungen z. vergleich. Anat. d. Wirbelthiere' (Leipzig, 1864-5): erstes Heft, Carpus u. Tarsus; zweites Heft, Brustflosse d. Fische.

"Ueb. d. Skelet d. Gliedmaassen d. Wirbelthiere in Allgemeinen u. d. Hingliedmaassen d. Selachier insbesondere," *Jenaische Zeitschrift*, vol. v. 1870.

"Ueb. d. Archipterygium," *Jenaische Zeitschrift*, vol. vii. 1873.

"Zur Morphologie d. Gliedmaassen d. Wirbelthiere," *Morphologisches Jahrbuch*, vol. ii. 1876.

exhibits may be derived from a ground-form which persists in a few cases only, and which represents the first, and consequently the lowest, stage of the skeleton in the fin—the *archipterygium*. This is made up of a stem which consists of jointed pieces of cartilage, which is articulated to the shoulder-girdle and is beset on either side with rays which are likewise jointed. In addition to the rays of the stem there are others which are directly attached to the limb-girdle.

“*Ceratodus* has a fin-skeleton of this form; in it there is a stem beset with two rows of rays. But there are no rays in the shoulder-girdle. This biserial investment of rays on the stem of the fin may also undergo various kinds of modifications. Among the Dipnoi, *Protopterus* retains the medial row of rays only, which have the form of fine rods of cartilage; in the Selachii, on the other hand, the lateral rays are considerably developed. The remains of the medial row are ordinarily quite small, but they are always sufficiently distinct to justify us in supposing that in higher forms the two sets of rays might be better developed. Rays are still attached to the stem and are connected with the shoulder-girdle by means of larger plates. The joints of the rays are sometimes broken up into polygonal plates which may further fuse with one another; concrescence of this kind may also affect the pieces which form the base of the fin. By regarding the free rays, which are attached to these basal pieces, as belonging to these basal portions, we are able to divide the entire skeleton of the fin into three segments—pro-, meso-, and metapterygium.

“The metapterygium represents the stem of the archipterygium and the rays on it. The propterygium and the mesopterygium are evidently derived from the rays which still remain attached to the shoulder-girdle.”

Since the publication of the memoirs of Thacker, Mivart, and myself a pupil of Gegenbaur's, M. v. Davidoff<sup>1</sup>, has made a series of very valuable observations, in part directed towards demonstrating the incorrectness of our theoretical views, more especially Thacker's and Mivart's view of the genesis of the skeleton of the limbs. Gegenbaur<sup>2</sup> has also written a short paper in connexion with Davidoff's memoir, in support of his own as against our views.

It would not be possible here to give an adequate account of Davidoff's observations on the skeleton, muscular system, and nerves of the pelvic fins. His main argument against the view that the paired fins are the remains of a continuous lateral fin is based on the fact that a variable but often considerable number of the spinal nerves in front of the pelvic fin are united by a longitudinal commissure with the true plexus of the nerves supplying the fin. From this he concludes that the pelvic fin has shifted its position, and that it may once therefore have been situated close behind the

<sup>1</sup> M. v. Davidoff, “Beiträge z. vergleich. Anat. d. hinteren Gliedmaassen d. Fische, I.” *Morphol. Jahrbuch*, vol. v. 1879.

<sup>2</sup> “Zur Gliedmaassenfrage. An die Untersuchungen von Davidoff's angeknüpfte Bemerkungen,” *Morphol. Jahrbuch*, vol. v. 1879.

visceral arches. Granting, however, that Davidoff's deduction from the character of the pelvic plexus is correct, there is, so far as I see, no reason in the nature of the lateral-fin theory why the pelvic fins should not have shifted; and, on the other hand, the longitudinal cord connecting some of the ventral roots in front of the pelvic fin may have another explanation. It may, for instance, be a remnant of the time when the pelvic fin had a more elongated form than at present, and accordingly extended further forwards.

In any case our knowledge of the nature and origin of nervous plexuses is far too imperfect to found upon their characters such conclusions as those of Davidoff.

Gegenbaur, in his paper above quoted, further urges against Thacker and Mivart's views the fact that there is no proof that the fin of *Polyodon* is a primitive type; and also suggests that the epithelial line which I have found connecting the embryonic pelvic and pectoral fins in *Torpedo* may be a rudiment indicating a migration backwards of the pelvic fin.

With reference to the development of the pectoral fin in the Teleostei there are some observations of 'Swirski<sup>1</sup>, which unfortunately do not throw very much light upon the nature of the limb.

'Swirski finds that in the Pike the skeleton of the limb is formed of a plate of cartilage continuous with the pectoral girdle, which soon becomes divided into a proximal and a distal portion. The former is subsequently segmented into five basal rays, and the latter into twelve parts, the number of which subsequently becomes reduced.

The observations which I have to lay before the Society were made with the object of determining how far the development of the skeleton of the limbs throws light on the points on which the anatomists whose opinions have just been quoted are at variance.

They were made, in the first instance, to complete a chapter in my work on comparative embryology; and, partly owing to the press of other engagements, but still more to the difficulty of procuring material, my observations are confined to the two British species of the genus *Scyllium*, viz. *Sc. stellare* and *Sc. canicula*; yet I venture to believe that the results at which I have arrived are not wholly without interest.

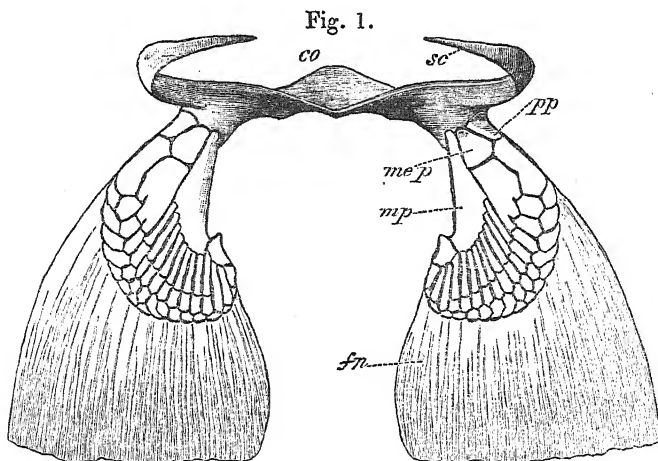
Before dealing with the development of the skeleton of the fin, it will be convenient to describe with great brevity the structure of the pectoral and pelvic fins of the adult. The pectoral fins consist of broad plates inserted horizontally on the sides of the body; so that in each there may be distinguished a dorsal and a ventral surface, and an anterior and a posterior border. Their shape may best be gathered from the woodcut (fig. 1); and it is to be especially noted that the narrowest part of the fin is the base, where it is attached to the side of the body. The cartilaginous skeleton only occupies

<sup>1</sup> G. 'Swirski, 'Untersuch. üb. d. Entwickl. d. Schultergürtels u. d. Skelets d. Brustflosse d. Hechts.' Inaug. Diss. Dorpat, 1880.



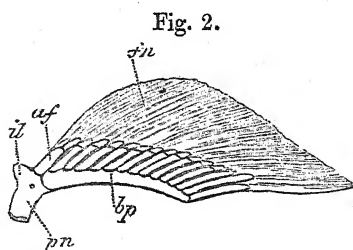
a small zone at the base of the fin, the remainder being formed of a fringe supported by radiately arranged horny fibres<sup>1</sup>.

The true skeleton consists of three basal pieces articulating with the pectoral girdle; on the outer side of which there is a series of more



Pectoral fins and girdle of an adult of *Scyllium canicula*  
(natural size, seen from behind and above.)

co. Coracoid; sc. scapula; pp. pterygium; me p. mesopterygium;  
mp. metapterygium; fn. part of fin supported by horny fibre.



Right pelvic fin and part of pelvic girdle of an adult female of *Scyllium canicula* (natural size).

il. iliac process; pn. pubic process, cut across below; bp. basipterygium;  
af. anterior cartilaginous fin-ray articulated to pelvic girdle; fn. part of fin  
supported by horny fibres.

or less segmented cartilaginous fin-rays. Of the basal cartilages one (pp) is anterior, a second (me p) is placed in the middle, and a third is posterior (mp). They have been named by Gegenbaur the pro-

<sup>1</sup> The horny fibres are mesoblastic products; they are formed, in the first instance, as extremely delicate fibrils on the inner side of the membrane separating the epiblast from the mesoblast.

*pterygium*, the *mesopterygium*, and the *metapterygium*; and these names are now generally adopted.

The *metapterygium* is by far the most important of the three, and in *Scyllium canicula* supports 12 or 13 rays<sup>1</sup>. It forms a large part of the posterior boundary of the fin, and bears rays only on its anterior border.

The *mesopterygium* supports 2 or 3 rays, in the basal parts of which the segmentation into distinct rays is imperfect; and the *propterygium* supports only a single ray.

The pelvic fins are horizontally placed, like the pectoral fins, but differ from the latter in nearly meeting each other along the median ventral line of the body. They also differ from the pectoral fins in having a relatively much broader base of attachment to the sides of the body. Their cartilaginous skeleton (woodcut, fig. 2) consists of a basal bar, placed parallel to the base of the fin, and articulated in front with the pelvic girdle.

On its outer border it articulates with a series of cartilaginous fin-rays. I shall call the basal bar the *basipterygium*. The rays which it bears are most of them less segmented than those of the pectoral fin, being only divided into two; and the posterior ray, which is placed in the free posterior border of the fin, continues the axis of the *basipterygium*. In the male it is modified in connexion with the so-called clasper.

The anterior fin-ray of the pelvic fin, which is broader than the other rays, articulates directly with the pelvic girdle, instead of with the *basipterygium*. This ray, in the female of *Scyllium canicula* and in the male of *Scyllium catulus* (Gegenbaur), is peculiar in the fact that its distal segment is longitudinally divided into two or more pieces, instead of being single as is the case with the remaining rays. It is probably equivalent to two of the posterior rays.

*Development of the paired Fins.*—The first rudiments of the limbs appear in *Scyllium*, as in other fishes, as slight longitudinal ridge-like thickenings of the epiblast, which closely resemble the first rudiments of the unpaired fins.

These ridges are two in number on each side—an anterior immediately behind the last visceral fold, and a posterior on the level of the cloaca. In most fishes they are in no way connected; but in some Elasmobranch embryos, more especially in that of *Torpedo*, they are connected together at their first development by a line of columnar-epiblast cells. This connecting line of columnar epiblast, however, is a very transitory structure. The rudimentary fins soon become more prominent, consisting of a projecting ridge both of epiblast and mesoblast, at the outer edge of which is a fold of epiblast only, which soon reaches considerable dimensions. At a later stage the mesoblast penetrates into this fold, and the fin becomes a simple ridge of mesoblast covered by epiblast. The pectoral fins are at first considerably ahead of the pelvic fins in development.

The direction of the original epithelial line which connected the

<sup>1</sup> In one example where the *metapterygium* had 13 rays the *mesopterygium* had only 2 rays.

two fins of each side is nearly, though not quite, longitudinal, sloping somewhat obliquely ventralwards. It thus comes about that the attachment of each pair of limbs is somewhat on a slant, and that the pelvic pair nearly meet each other in the median ventral line shortly behind the anus.

The embryonic muscle-plates, as I have elsewhere shown, grow into the bases of the fins; and the cells derived from these ingrowths, which are placed on the dorsal and ventral surfaces in immediate contact with the epiblast, probably give rise to the dorsal and ventral muscular layers of the limb, which are shown in section in Plate LVII. fig. 1 *m* and in Plate LVIII. fig. 7 *m*.

The cartilaginous skeleton of the limbs is developed in the indifferent mesoblast cell between the two layers of muscles. Its early development in both the pectoral and the pelvic fins is very similar. When first visible it differs histologically from the adjacent mesoblast simply in the fact of its cells being more concentrated; while its boundary is not sharply marked.

At this stage it can only be studied by means of sections. It arises simultaneously and continuously with the pectoral and pelvic girdles, and consists, in both fins, of a bar springing at right angles from the posterior side of the pectoral or pelvic girdle, and running parallel to the long axis of the body along the base of the fin. The outer side of this bar is continued into a thin plate, which extends into the fin.

The structure of the skeleton of the fin slightly after its first differentiation will be best understood from Plate LVII. fig. 1, and Plate LVIII. fig. 7. These figures represent transverse sections through the pelvic and pectoral fins of the same embryo on the same scale. The basal bar is seen at *bp*, and the plate at this stage (which is considerably later than the first differentiation) already partially segmented into rays at *br*. Outside the region of the cartilaginous plate is seen the fringe with the horny fibres (*h.f*); and dorsally and ventrally to the cartilaginous skeleton are seen the already well-differentiated muscles (*m*).

The pectoral fin is shown in horizontal section in Plate LVIII. fig. 6, at a somewhat earlier stage than that to which the transverse sections belong. The pectoral girdle (*p.g*) is cut transversely, and is seen to be perfectly continuous with the basal bar (*bp*) of the fin. A similar continuity between the basal bar of the pelvic fin and the pelvic girdle is shown in Plate LVII. fig. 2, at a somewhat later stage. The plate continuous with the basal bar of the fin is at first, to a considerable extent in the pectoral, and to some extent in the pelvic fin, a continuous lamina, which subsequently segments into rays. In the parts of the plate which eventually form distinct rays, however, almost from the first the cells are more concentrated than in those parts which will form the tissue between the rays; and I am not inclined to lay any stress whatever upon the fact of the cartilaginous fin-rays being primitively part of a continuous lamina, but regard it as a secondary phenomenon, dependent on the mode of conversion of embryonic mesoblast cells into cartilage. In all cases the separation

into distinct rays is to a large extent completed before the tissue of which the plates are formed is sufficiently differentiated to be called cartilage by an histologist.

The general position of the fins in relation to the body, and their relative sizes, may be gathered from Plate LVII. figs. 4 and 5, which represent transverse sections of the same embryo as that from which the transverse sections showing the fin on a larger scale were taken.

During the first stage of its development the skeleton of both fins may thus be described as consisting of a *longitudinal bar running along the base of the fin, and giving off at right angles series of rays which pass into the fin*. The longitudinal bar may be called the basipterygium; and it is continuous in front with the pectoral or pelvic girdle, as the case may be.

The further development of the primitive skeleton is different in the case of the two fins.

*The Pelvic Fin.*—The changes in the pelvic fin are comparatively slight. Plate LVII. fig. 2 is a representation of the fin and its skeleton in a female of *Scyllium stellare* shortly after the primitive tissue is converted into cartilage, but while it is still so soft as to require the very greatest care in dissection. The fin itself forms a simple projection of the side of the body. The skeleton consists of a basipterygium (*bp*), continuous in front with the pelvic girdle. To the outer side of the basipterygium a series of cartilaginous fin-rays are attached—the posterior ray forming a direct prolongation of the basipterygium, while the anterior ray is united rather with the pelvic girdle than with the basipterygium. All the cartilaginous fin-rays except the first are completely continuous with the basipterygium, their structure in section being hardly different from that shown in Plate LVII. fig. 1.

The external form of the fin does not change very greatly in the course of the further development; but the hinder part of the attached border is, to some extent, separated off from the wall of the body, and becomes the posterior border of the adult fin. With the exception of a certain amount of segmentation in the rays, the character of the skeleton remains almost as in the embryo. The changes which take place are illustrated by Plate LVII. fig. 3, showing the fin of a young male of *Scyllium stellare*. The basipterygium has become somewhat thicker, but is still continuous in front with the pelvic girdle, and otherwise retains its earlier characters. The cartilaginous fin-rays have now become segmented off from it and from the pelvic girdle, the posterior end of the basipterygial bar being segmented off as the terminal ray.

The anterior ray is directly articulated with the pelvic girdle, and the remaining rays continue articulated with the basipterygium. Some of the latter are partially segmented.

As may be gathered by comparing the figure of the fin at the stage just described with that of the adult fin (woodcut, fig. 2), the remaining changes are very slight. The most important is the segmentation of the basipterygial bar from the pelvic girdle.

The pelvic fin thus retains in all essential points its primitive structure.

*The Pectoral Fin.*—The earliest stage of the pectoral fin differs, as I have shown, from that of the pelvic fin only in minor points (Plate LVIII. fig. 6). There is the same longitudinal or basipterygial bar (*bp*), to which the fin-rays are attached, which is continuous in front with the pectoral girdle (*pg*). The changes which take place in the course of the further development, however, are very much more considerable in the case of the pectoral than in that of the pelvic fin.

The most important change in the external form of the fin is caused by a reduction in the length of its attachment to the body. At first (Plate LVIII. fig. 6), the base of the fin is as long as the greatest breadth of the fin; but it gradually becomes shortened by being constricted off from the body at its hinder end. In connexion with this process the posterior end of the basipterygial bar is gradually rotated outwards, its anterior end remaining attached to the pectoral girdle. In this way this bar comes to form the posterior border of the skeleton of the fin (Plate LVIII. figs. 8 & 9), constituting the metapterygium (*mp*). It becomes eventually segmented off from the pectoral girdle, simply articulating with its hinder edge.

The plate of cartilage, which is continued outwards from the basipterygium, or, as we may now call it, the metapterygium, into the fin, is not nearly so completely divided up into fin-rays as the homologous part of the pelvic fin; and this is especially the case with the basal part of the plate. This basal part becomes, in fact, at first only divided into two parts (Plate LVIII. fig. 8)—a small anterior part at the front end (*me.p*), and a larger posterior along the base of the metapterygium (*mp*); and these two parts are not completely segmented from each other. The anterior part directly joins the pectoral girdle at its base, resembling in this respect the anterior fin-ray of the pelvic girdle. It constitutes the (at this stage undivided) rudiment of the mesopterygium and propterygium of Gegenbaur. It bears in my specimen of this age four fin-rays at its extremity, the anterior not being well marked. The remaining fin-rays are prolongations outwards of the edge of the plate continuous with the metapterygium. These rays are at the stage figured more or less transversely segmented; but at their outer edge they are united together by a nearly continuous rim of cartilage. The spaces between the fin-rays are relatively considerably larger than in the adult.

The further changes in the cartilages of the pectoral limb are, morphologically speaking, not important, and are easily understood by reference to Plate LVIII. fig. 9 (representing the skeleton of the limb of a nearly ripe embryo). The front end of the anterior basal cartilage becomes segmented off as a propterygium (*pp*), bearing a single fin-ray, leaving the remainder of the cartilage as a mesopterygium (*mes*). The remainder of the now considerably segmented fin-rays are borne by the metapterygium.

*General Conclusions.*—From the above observations, conclusions of a positive kind may be drawn as to the primitive structure of the

skeleton; and the observations have also, it appears to me, important bearings on the theories of my predecessors in this line of investigation.

The most obvious of the positive conclusions is to the effect that the embryonic skeleton of the paired fins consists of a series of parallel rays similar to those of the unpaired fins. These rays support the soft parts of the fins, which have the form of a longitudinal ridge; and they are continuous at their base with a longitudinal bar. This bar, from its position at the base of the fin, can clearly never have been a median axis with the rays on both sides. It becomes the basipterygium in the pelvic fin, which retains its embryonic structure much more completely than the pectoral fin; and the metapterygium in the pectoral fin. The metapterygium of the pectoral fin is thus clearly homologous with the basipterygium of the pelvic fin, as originally supposed by Gegenbaur, and as has since been maintained by Mivart. The propterygium and mesopterygium are obviously relatively *unimportant* parts of the skeleton as compared with the metapterygium.

My observations on the development of the skeleton of the fins certainly do not of themselves demonstrate that the paired fins are remnants of a once continuous lateral fin; but they support this view in that they show the primitive skeleton of the fins to have exactly the character which might have been anticipated if the paired fins had originated from a continuous lateral fin. The longitudinal bar of the paired fins is believed by both Thacker and Mivart to be due to the coalescence of the bases of the primitively independent rays of which they believe the fin to have been originally composed. This view is probable enough in itself, and is rendered more so by the fact, pointed out by Mivart, that a longitudinal bar supporting the cartilaginous rays of unpaired fins is occasionally formed; but there is no trace in the embryo Scylliums of the bar in question being formed by the coalescence of rays, though the fact of its being perfectly continuous with the bases of the fin-rays is somewhat in favour of such coalescence.

Thacker and Mivart both hold that the pectoral and pelvic girdles are developed by ventral and dorsal growths of the anterior end of the longitudinal bar supporting the fin-rays.

There is, so far as I see, no theoretical objection to be taken to this view; and the fact of the pectoral and pelvic girdles originating continuously and long remaining united with the longitudinal bars of their respective fins is in favour of it rather than the reverse. The same may be said of the fact that the first part of each girdle to be formed is that in the neighbourhood of the longitudinal bar (basipterygium) of the fin, the dorsal and ventral prolongations being subsequent growths.

On the whole my observations do not throw much light on the theories of Thacker and Mivart as to the genesis of the skeleton of the paired fin; but, so far as they bear on the subject, they are distinctly favourable to those theories.

The main results of my observations appear to me to be decidedly adverse to the views recently put forward on the structure of the fin

by Gegenbaur and Huxley, both of whom, as stated above, consider the primitive type of fin to be most nearly retained in *Ceratodus*, and to consist of a central multisegmented axis with numerous lateral rays.

Gegenbaur derives the Elasmobranch pectoral fin from a form which he calls the archipterygium, nearly like that of *Ceratodus*, with a median axis and two rows of rays—but holds that in addition to the rays attached to the median axis, which are alone found in *Ceratodus*, there were other rays directly articulated to the shoulder-girdle. He considers that in the Elasmobranch fin the majority of the lateral rays on the posterior (or median according to his view of the position of the limb) side have become aborted, and that the central axis is represented by the metapterygium; while the pro- and mesopterygium and their rays are, he believes, derived from those rays of the archipterygium which originally articulated directly with the shoulder-girdle.

This view appears to me to be absolutely negatived by the facts of development of the pectoral fin in *Scyllium*—not so much because the pectoral fin in this form is necessarily to be regarded as primitive, but because what Gegenbaur holds to be the primitive axis of the biserial fin is demonstrated to be really the base, and it is only in the adult that it is conceivable that a second set of lateral rays could have existed on the posterior side of the metapterygium. If Gegenbaur's view were correct, we should expect to find in the embryo, if anywhere, traces of the second set of lateral rays; but the fact is that, as may easily be seen by an inspection of figs. 6 and 7, such a second set of lateral rays could not possibly have existed in a type of fin like that found in the embryo. With this view of Gegenbaur's it appears to me that the theory held by this anatomist to the effect that the limbs are modified gill-arches also falls, in that his method of deriving the limbs from gill-arches ceases to be admissible, while it is not easy to see how a limb, formed on the type of the embryonic limb of Elasmobranchs, could be derived from a gill-arch with its branchial rays.

Gegenbaur's older view, that the Elasmobranch fin retains a primitive uniserial type, appears to me to be nearer the truth than his more recent view on this subject; though I hold the fundamental point established by the development of these parts in *Scyllium* to be that the posterior border of the adult Elasmobranch pectoral fin is the primitive base-line, *i.e.* line of attachment of the fin to the side of the body.

Huxley holds that the mesopterygium is the proximal piece of the axial skeleton of the limb of *Ceratodus*, and derives the Elasmobranch fin from that of *Ceratodus* by the shortening of its axis and the coalescence of some of its elements. The entirely secondary character of the mesopterygium, and its total absence in the young embryo *Scyllium*, appear to me as conclusive against Huxley's view as the character of the embryonic fin is against that of Gegenbaur; and I should be much more inclined to hold that the fin of *Ceratodus* has been derived from a fin like that of the Elasmobranchs by a series of steps similar to those which Huxley supposes to have led

to the establishment of the Elasmobranch fin, but in exactly the reverse order.

There is one statement of Davidoff's which I cannot allow to pass without challenge. In comparing the skeletons of the paired and unpaired fins he is anxious to prove that the former are independent of the axial skeleton in their origin and that the latter have been segmented from the axial skeleton, and thus to show that an homology between the two is impossible. In support of his view he states<sup>1</sup> that he has satisfied himself, from embryos of *Acanthias* and *Scyllium*, that the rays of the unpaired fins are undoubtedly products of the segmentation of the dorsal and ventral spinous processes.

This statement is wholly unintelligible to me. From my examination of the development of the first dorsal and the anal fins of *Scyllium* I find that their rays develop at a considerable distance from, and quite independently of, the neural and hæmal arches, and that they are at an early stage of development distinctly in a more advanced state of histological differentiation than the neural and hæmal arches of the same region. I have also found exactly the same in the embryos of *Lepidosteus*.

I have, in fact, no doubt that the skeleton of both the paired and the unpaired fins of Elasmobranchs and *Lepidosteus* is in its development independent of the axial skeleton. The phylogenetic mode of origin of the skeleton both of the paired and of the unpaired fins cannot, however, be made out without further investigation.

#### EXPLANATION OF THE PLATES.

##### PLATE LVII.

- Fig. 1. Transverse section through the pelvic fin of an embryo of *Scyllium* belonging to stage P<sup>2</sup>, magnified 50 diameters. *bp*, basipterygium; *br*, fin ray; *m*, muscle; *hf*, horny fibres supporting the peripheral part of the fin.
2. Pelvic fin of a very young female embryo of *Scyllium stellare*, magnified 16 diameters. *bp*, basipterygium; *pu*, pubic process of pelvic girdle (cut across below); *il*, iliac process of pelvic girdle; *fo*, foramen.
3. Pelvic fin of a young male embryo of *Scyllium stellare*, magnified 16 diameters. *bp*, basipterygium; *mo*, process of basipterygium continued into clasper; *il*, iliac process of pelvic girdle; *pu*, pubic section of pelvic girdle.
4. Transverse section through the ventral part of the trunk of an embryo *Scyllium* of stage P, in the region of the pectoral fins, to show how the fins are attached to the body, magnified 18 diameters. *br*, cartilaginous fin-ray; *bp*, basipterygium; *m*, muscle of fin; *m p*, muscle-plate.
5. Transverse section through the ventral part of the trunk of an embryo *Scyllium* of stage P, in the region of the pelvic fin, on the same scale as fig. 4. *bp*, basipterygium; *br*, cartilaginous fin-rays; *m*, muscle of the fins; *m p*, muscle-plate.

##### PLATE LVIII.

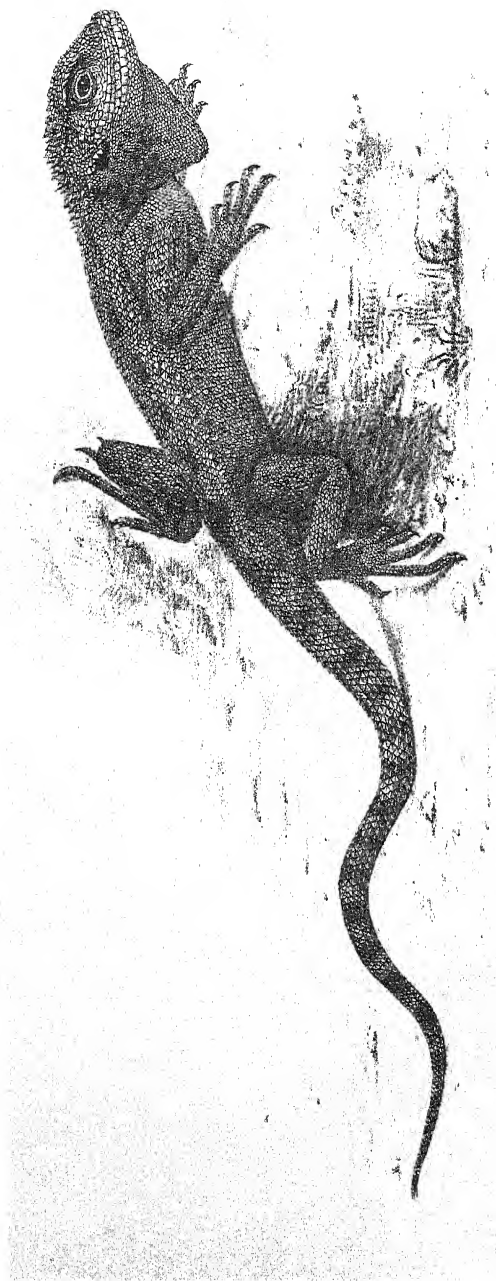
- Fig. 6. Pectoral fin of an embryo of *Scyllium canicula*, of a stage between O

<sup>1</sup> Loc. cit. p. 514.

<sup>2</sup> I employ here the same letters to indicate the stages as in my Monograph on Elasmobranch Fishes.







R. Minton del et lith.

AGAMA PERSICA.

Minton Brev. imp.

and P, in longitudinal and horizontal section (the skeleton of the fin was still in the condition of embryonic cartilage), magnified 36 diameters. *bp*, basipterygium (eventual metapterygium); *fr*, cartilaginous fin-rays; *pg*, pectoral girdle in transverse section; *fo*, foramen in pectoral girdle; *pe*, epithelium of peritoneal cavity.

Fig. 7. Transverse section through the pectoral fin of a *Scyllium* embryo of stage P, magnified 50 diameters. *bp*, basipterygium; *br*, cartilaginous fin-ray; *m*, muscle; *hf*, horny fibres.

8. Pectoral fin of an embryo of *Scyllium stellare*, magnified 16 diameters. *mp*, metapterygium (basipterygium of earlier stage); *me.p*, rudiment of future pro- and mesopterygium; *sc*, cut surface of a scapular process; *cr*, coracoid process; *fr*, foramen; *hf*, horny fibres.

9. Skeleton of the pectoral fin and part of pectoral girdle of a nearly ripe embryo of *Scyllium stellare*, magnified 10 diameters. *mp*, metapterygium; *mes*, mesopterygium; *pp*, propterygium; *cr*, coracoid process.

## 2. On a Collection of Persian Reptiles recently added to the British Museum. By W. T. BLANFORD.

[Received April 1, 1881.]

(Plate LIX.)

Rather more than a year ago Dr. Günther told me that the British Museum had obtained, by purchase, a collection of Lizards and Snakes from Persia, and very obligingly offered to place it at my disposal for the purpose of examination. The collector is not known; but the specimens have been carefully labelled with the localities, and the labels have been attached to the bottles. Several of the species had already been determined by Dr. Günther himself; the remainder had been left for further examination at leisure.

The following is a list, with the localities; notes on most of the species are appended. The greater number of the localities are in the neighbourhood of Bushire, or on the road from Bushire to Isfahan *via* Shiráz. It is remarkable that some of the commonest Persian Lizards, such as the forms of *Eremias*, are wanting. The species in the following list not included in my former account of Persian reptiles<sup>1</sup> are marked with an asterisk.

### LACERTILIA.

#### AGAMA AGILIS.

*Agama agilis*, Olivier, Voyage dans l'Empire Othoman, l'Egypte et la Perse, vol. ii. p. 428, Atlas, pl. 29. fig. 2; Dum. et Bibr. Erp. Gén. vol. iv. p. 496; Gray, Cat. Sp. Líz. B. M. p. 257; C. Dum. Cat. Méth. Coll. Rept. p. 102.

Abadeh and Dehbid, north of Shiráz, on the road to Isfahán, and Kázrun, between Shiraz and Bushire.

In my notes on this species in 'Eastern Persia,' ii. p. 314, I observed that I had not met with it at any considerable elevation

<sup>1</sup> 'Eastern Persia,' vol. ii. pp. 305-431.

above the sea; Abadeh, at 6000 feet, is a higher locality than any previously recorded.

In the Journal of the Asiatic Society of Bengal for 1879, vol. xlviii. p. 129, I mentioned that Dr. Peters had written to me that the Lizard from Persia and Western India referred by Mr. Blyth, Mr. Theobald, Dr. Anderson, and myself, to the present species is really the *Lacerta sanguinolenta* of Pallas, and *Agama aralensis* of Lichtenstein, and that it must be distinguished from the true *A. agilis* of Olivier, which is a form allied to *A. (Trapelus) ruderata*. As I had not Olivier's work in Calcutta, I could not go into this question; but now, after doing so, I am inclined to retain the name of *A. agilis* for the Persian form.

I have again compared the Persian, Baluchistan, and Sind specimens, of which there is now a fine series in the British Museum, with Olivier's original description and figure, and with the more detailed characters given by Duméril and Bibron (*l. c.*). I have also gone carefully through Pallas's description of *Lacerta sanguinolenta*<sup>1</sup>, Eichwald's description and figure of *Agama sanguinolenta*<sup>2</sup>, Lichtenstein's description of *Agama aralensis*<sup>3</sup>, and, lastly, Rüppell's figure and description of *Trapelus flavimaculatus*<sup>4</sup> from Arabia; and I have examined the specimens in the Paris and Berlin Museums.

Besides the series from Persia, Baluchistan, and Sind, mostly collected by myself, there are in the British Museum good adults of a form labelled *Agama sanguinolenta* from three localities—Syr Darya (the river Jaxartes), Mangyschlak (doubtless the place of that name on the Caspian Sea), and West Goladnaja (I do not know the locality; but it is doubtless Central Asiatic, as the specimen was received from the St.-Petersburg Museum). The specimens from Syr Darya were collected by Severtzoff, and have been labelled *Stellio aralensis*. There is besides a young individual from Arabia, bearing the name *Agama flavimaculata*.

There are in the Paris Museum, amongst the specimens referred to *Agama agilis*, two that were collected by Olivier. I see no reason to doubt that these, which are mentioned in C. Duméril's Catalogue, are two of the original types. They and some other specimens in the same Museum, brought by Aucher-Eloy from Persia, appear to me (so far as I can judge without absolutely placing the specimens side by side) to be identical with the form I have already referred to Olivier's species. The figure and the brief characters in Olivier's work, and the much fuller description given by Duméril and Bibron, agree well with the Persian and Sind form, except that in both accounts the ventral scales are said to be smooth. This

<sup>1</sup> Zoog. Ros.-As. iii. p. 23.

<sup>2</sup> Fauna Caspio-caucasica, p. 80, pl. xiv. figs. 3, 4.

<sup>3</sup> Eversmann's 'Reise von Orenburg nach Buchara,' p. 144.

<sup>4</sup> Neue Wirbelthiere, Amphibien, p. 12, pl. vi. fig. 1. By Duméril and Bibron this reference is incorrectly given; and Rüppell's Atlas, Reise nördl. Afrika, is quoted instead of the later work. In Gray's 'Catalogue of Lizards' the synonymy for *Agama agilis* is the same as in Duméril and Bibron's work; and as the misquotation is repeated, the references were probably copied without verification.

is very rarely the case in the animals I have collected: the keels on the ventral scales are sometimes faint; and in one or two instances they are nearly or quite obsolete in old females; but as a rule they can be seen with ease. I find, however, on examining the specimens in the Paris Museum, that the ventral scales have for the most part lost their epidermis, and, with the outer coat, the keel has disappeared; whilst on one of the specimens procured by Olivier himself, on a small portion of the breast the epidermis remains, and a faint, but perfectly distinct keel can be traced on each scale.

There are, however, in the Berlin Museum two specimens of an *Agama* from Persia, distinguished from the common form by being more depressed, by having smooth ventral scales, and by the smaller size of the body-scales generally, there being 80 to 85 round the body, whilst in the common Persian form there are only 70 to 75. In consequence of the want of keels on the ventral scales, these Lizards were supposed by Dr. Peters to be the true *A. agilis*. I think, however, it is clear, from the evidence already stated, that the larger-scaled form, with keeled ventral scales, is the species described by Olivier. The depressed small-scaled Lizards may perhaps be a very aberrant variety; but they look like a distinct species.

It is as well, before proceeding further, to mention that the development of the keels on the scales is not the only variable character. There is much variation in the number of spinose scales at the side of the neck and behind the ear, and, indeed, in the extent to which the scales of the upper parts generally are "mucronate" (*i. e.* terminate in a spine posteriorly). There are sometimes, as stated by Duméril and Bibron, two rows of poriferous scales in front of the vent, sometimes only one, whilst in females the pores are small or absent.

Whether *Trapelus flavimaculatus* of Rüppell is the same Lizard, I should be loth to decide without seeing the types. There is nothing in the description adverse to the union of the forms. In the figure the shape of the head is represented as very different; but this may be a mistake. The flatter shape of the body and the absence of præanal pores may indicate, if the species be the same, that a female has served as the type. It is as well to note that in Rüppell's description the scales of the lower parts are said to have the keels only faintly indicated, whilst on the back most of the scales are stated to have a little point projecting behind, which appears as the end of an inconspicuous keel. This exactly defines the usual condition of the scales in adult females of the Persian Lizard.

The specimen in the British Museum labelled *A. flavimaculata* from Arabia, however, is not, I think, the same as *A. agilis*. It is a more depressed form, resembling *Trapelus ruderatus* in shape; and the scales of the back and sides are slightly unequal in size<sup>1</sup>.

<sup>1</sup> Peters (Monatsb. Akad. Berlin, 1869, p. 66) states that *Trapelus flavimaculatus*, Rüpp., is the same as *Agama savignii*, Audouin, and is distinguished from the true *A. agilis* by more or less distinctly keeled scales on the lower parts (after what has been stated above, this distinction cannot be considered sufficient), and by the scales behind and below the ear-orifice being larger and less numerous.

I now turn to the Central-Asiatic specimens. These are distinguished at the first glance from all the Persian examples by the greater development of keels to the scales throughout, and by those of the head, neck, and back being more spinose. This coincides with Pallas's description<sup>1</sup> of *Lacerta sanguinolenta*—"L. squamis carinatis imbricata, occipite muricato." The ventral scales are described as "*linea elevata carinata*."

Eichwald's description of *Agama sanguinolenta* is clearly applicable to the same form. *Agama aralensis* is very imperfectly described by Lichtenstein, but is stated to have fringed edges to the toes<sup>2</sup>; so I should have thought it a distinct species. Dr. Peters, however, has probably examined the types, which should be in the Berlin Museum. The toes are not fringed in any of the Lizards examined by me.

C. Duméril (*l. c.*) states that *A. sanguinolenta* is distinguished from *A. agilis* by the ventral and lateral scales being keeled, and by the diameter of the ventral being much larger compared with the dorsal scales in *A. sanguinolenta* than in *A. agilis*. This latter distinction does not appear, judging from the specimens before me, to be any more constant than the former. The ventral scales are rather smaller in *A. agilis*; but the amount appears somewhat variable.

I find that some of the largest males collected by myself in the Indian desert between Sind and Jaisalmir have the strongly keeled and mucronate scales of *A. sanguinolenta*. I see no reason for considering these distinct from the other Sind and Persian specimens.

The conclusion to which I have come is:—that, so far as I can see, the form from Persia, Baluchistan, and Sind is the true *Agama agilis* of Olivier; that the identity of *Trapelus flavimaculatus* of Rüppell is probable, but not satisfactorily proved; and that the *Agama sanguinolenta* of the countries north of Persia and east of the Caspian, with which *Agama aralensis* is identified by Peters and apparently by Strauch<sup>3</sup>, is a variety of *A. agilis* with more keeled and spinose scales.

\* *AGAMA PERSICA*, sp. nov. (Plate LIX.)

*A. sine crista distinguenda nuchali vel dorsali, capite alto, trunco depresso, squamis dorsalibus inæqualibus carinatis atque in maribus mucronatis, in medio dorso majoribus, ad latera minoribus, aliis maximis, sed nunquam illas in medio dorso diametro duplo excedentibus, singulatim intermixtis.*

Dehbid and Kázrun.

Form moderately depressed, similar to that of *A. agilis*, except

<sup>1</sup> Pallas did not examine the species himself, but published Gùldenstädt's notes on it.

<sup>2</sup> Eichwald describes those of *Agama sanguinolenta* as "subfimbriati."

<sup>3</sup> The list of reptiles in Severtzoff's "Turkestanskje Jevotnie" was drawn up by Strauch, and includes *Stellio aralensis*. Specimens collected by Severtzoff, and labelled by this name, are, as already stated, in the British Museum, and are identical with *Agama sanguinolenta*. In the "Reptilia" of the Scientific Results of the Second Yarkand Mission, p. 6, note, I suggested the possibility of Lichtenstein's species not being a *Stellio*.

that the tail is shorter, being from  $1\frac{1}{3}$  to  $1\frac{2}{3}$  the length of the head and body. It is rounded throughout, and decreases regularly in size. Head short and high, with the canthus rostralis well marked, and supraorbital ridge prominent. The height of this ridge above the lip-margin is equal to the distance from the anterior corner of the eye to the end of the snout, or from the posterior corner of the eye to the ear. No crest. A well-marked gular sac, much larger in males than in females, and a double fold across the throat, the hinder fold running up in front of the shoulder on each side. In adult males, the fore limb laid back just touches the thigh, the hind limb laid forward extends to the neighbourhood of the ear; in females the limbs are a little shorter. In the fore foot the fingers increase nearly regularly in length from the first to the fourth, the fourth is decidedly longer than the third, and the end of the fifth is beyond that of the first. In the hind foot the fourth toe is one quarter longer than the third, and the fifth terminates nearly opposite to the first.

All the scales on the upper part of the head are distinctly keeled; there are a few scattered spinose scales about the occiput, and a little group of half a dozen small spines above the ear. The nostril, which is at the end of the canthus, and is directed backwards and upwards, lies in the hinder part of a large shield. Supraorbital ridge formed of elongate scales obliquely placed. From 30 to 40 small square labials round each lip, sometimes not larger, sometimes rather larger than the adjoining scales; all are swollen and subcarinate. Upper median labial (rostral) variable; the lower is about twice as broad and high as the other labials. Scales at side of head, especially those in front of the eye, immediately beneath it, and behind it, keeled. Scales of chin and throat rhomboidal, bluntly keeled.

Scales of neck small, with small conical spines scattered singly and in groups on both sides. All the scales of the neck, body, limbs, and tail are keeled and thoroughly imbricate. Along the back of the neck the scales are unequal in size, and there is sometimes a longitudinal tract covered with small scales, sometimes a rudimentary crest. Dorsal scales very unequal, larger scales being scattered over the back and sides; but none are double the diameter of the scales occupying the middle of the back. In males the dorsal scales are raised into short trigonal spines; in females the scales are not distinctly spinose, but they are strongly keeled throughout. The ordinary scales in the middle of the back are considerably larger than on the sides. Ventral scales flatter, but still distinctly keeled, and pointed or submucronate at the posterior extremity; they are a little larger than the scales on the sides, but smaller than those on the back. About from 75 to 85 scales round the middle of the body. Beneath the feet the scales are tricuspid, being strongly keeled, with a small projecting point on the distal margin at each side of the keel. Claws strong and dark horny, those of the fore feet longer than those of the hind feet. Preanal pores forming a single not very conspicuous row in males, wanting in females.

Colour (in spirit) above earthy grey, with more or less distinct

darker cross bands on the trunk and limbs, often interrupted on the former. Tail with numerous imperfect dark rings. In some specimens the enlarged scales of the back and sides are whitish, producing a speckled appearance. The chin and throat in males and the gular sac speckled with dusky or blue, or altogether dark indigo; rest of lower parts white.

Length of an adult male 8 inches, of which the tail is 5; of a female 7·8, of which the tail is 4·4.

This species is intermediate between typical *Agama* and the Asiatic forms of *Trapelus*: it has the general form of the first-named, and the irregularity in the dorsal scales characteristic of the latter. It is easily distinguished from *Agama agilis* and *A. sinaita* by the inequality of the dorsal scales, and from *Trapelus ruderatus*, *T. megalonyx*<sup>1</sup>, and *T. rubrigularis*<sup>2</sup> by its less depressed form, longer limbs, higher head, and more prominent canthus rostralis, by the strong and persistent keels on the dorsal scales, and by the much smaller difference between the enlarged scales of the back and the ordinary dorsal scales.

The nearest ally I have seen is a species represented by two specimens in the British Museum. These specimens are said to be from Egypt, and to have been presented by Mr. Burton. They were the two examples referred by Dr. Gray in his 'Catalogue of Lizards,' p. 258, to *Trapelus savignii*. As, however, *T. savignii* is said, in Dr. Gray's own description of the species, to have "nape and back with a crest, scales of the back rather large, equal," and was originally described by Duméril and Bibron<sup>3</sup> (from a figure apparently) as having a crest extending from the occiput to the tail, and the scales of the upper part of the body equal to each other, it is difficult to understand how these specimens, which are crestless and have unequal dorsal scales, can be referred to the species. The Lizard in question is only distinguished from *A. persica* by the dorsal scales being more irregular and less strongly keeled, the head less raised, the canthus less prominent, and by the scales above the supraorbital tracts being convex but not keeled.

*Agama persica* is represented in the collection by five specimens, four of which are from Dehbid.

#### STELLIO NUPTUS.

##### Kázrun and Shiráz.

The two specimens from Shiráz, both males, are black almost throughout. They were taken on the 26th April. I suspect that the black colour is seasonal. These specimens agree with the variety I called *fuscus* ('Eastern Persia,' ii. p. 319) in colour and in the obliteration of the nuchal fold.

A female from Kázrun, captured April 16th, contains large eggs.

<sup>1</sup> Günther, Rept. Brit. Ind. p. 159, pl. xiv. fig. C.

<sup>2</sup> W. T. Blanford, J. A. S. B. 1876, xlv. p. 23, pl. i. fig. 1.

<sup>3</sup> Erp. Gén. iv. p. 508.



## CENTROTRACHELUS LORICATUS.

Ghorak. (I think this must be the same as a place marked Gurek on St. John's map, 15 miles east of Bushire.)

Both the two specimens collected are small, the largest barely 12 inches long, and the smaller only 6. Though rather darker than the type of *C. loricatus*, they have none of the olive coloration of *C. asmussi*. They agree with the former in the more distant rows of tubercles on the back, and in having the keels of the scales beneath the hind feet arranged in transverse, and not in oblique rows. More specimens, however, and especially adults, are requisite in order to show whether these two forms are really separable.

## PSAMMOSAURUS SCINCUS.

Konar Takhti (20 miles south-west of Kázrun) and Ghainak (I do not know the latter locality).

The specimens (three in number) are quite undistinguishable from Egyptian examples in the British Museum. I see no probability of *P. caspius* being really distinct.

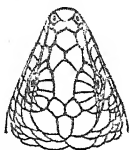
## \*SCINCUS CONIROSTRIS, sp. nov.

*S. affinis S. officinali, sed capite brevior, magis conico, scutis supranasalibus contingentibus atque præfrontale a rostrali secernentibus, distinguendus.*

Tangyak, 7 miles south of Bushire.

Nearly allied to *S. officinalis*, so nearly as to be merely a local race; but the head is differently shaped, being shorter and more

Fig. 1.

Head of *Scincus conirostris*.

conical, the length of the head from the occiput to the end of the nose being nearly equal to the width of the body between the axils of the fore limbs or very little greater. Another distinction, which is constant so far as I can judge from the series of *S. officinalis* in the Museum, is that in the latter the præfrontal shield is always in contact with the rostral, whereas in the Persian form the two are separated from each other by the supranasals. The vertical shield is proportionally shorter in *S. conirostris*. In all other respects the two forms appear to be similar; and the coloration is identical.

So far as I am aware there are, besides *S. officinalis*, three de-

scribed forms of the genus *Scincus*. These are *S. meccensis*<sup>1</sup> from Arabia, *S. hemprichii*<sup>2</sup> from Massowa, on the Abyssinian coastland, and *S. mitranus*<sup>3</sup>, supposed to be from Arabia.

Of these, *S. hemprichii*, the type of the subgenus *Pedorychus* of Wiegmann, is evidently quite distinct, having a rounded canthus rostralis, the ear-opening very narrow and concealed by a scale, the nostrils differently shaped, and striated dorsal scales. *S. meccensis* is said to differ from *S. officinalis* in having five superciliary shields instead of six, the dorsal scales in sixteen longitudinal series instead of eighteen, the supralabials seven, of which the fifth and sixth are beneath the eye, whereas in *S. officinalis* there are eight, the sixth and seventh below the eye—and in coloration, there being two or three rufous dusky spots on each side above the shoulders. I am inclined to doubt whether these characters are of specific value.

In the unpublished figures made for Hemprich and Ehrenberg's 'Symbolæ Physicæ,' tab. iv. fig. 3, the præfrontal is shown to be in contact with the rostral.

*Scincus mitranus* was described from a single dried specimen. It is stated to differ from *S. officinalis* in the form of the snout<sup>4</sup>, in the head-shields, and in coloration. The præfrontal is in contact with the rostral, as in *S. officinalis*. There are five superciliaries, as in *S. meccensis*, two loreals, and eight supralabials. Each scale is said to have a white spot in the centre of its free margin, with a brown spot on either side. This is occasionally the case in *S. officinalis*, though more frequently a brown spot is in the middle of the scale. There are ten vertically elongated, more or less rounded, deep-red-brown spots along the side from the middle of the neck to above the thigh. Similar spots are seen in *S. meccensis*, though they are less numerous, being confined to the anterior portion of the side; and they may be merely a modification of the transverse bands often found in *S. officinalis*.

## OPHIDIA.

\**CATACHLÆNA*<sup>5</sup> *DIADEMA*, var.

*Heterodon diadema*, Dum. et. Bibr. Exp. Gén. vii. p. 779.

*Simotes diadema*, Günther, Cat. Col. Sn. B. M. p. 26.

*Chatachlein diadema*, Jan, Icon. Oph. livr. 10, pl. vi. fig. 2.

*Simotes (Chatachlein) diadema*, Böttger, Jahresber. Senck. naturf. Ges. 1878–79, p. 61.

Bushi, 25 miles south of Bushire.

The only specimen procured differs from the typical Algerine form of *C. diadema* in having two præoculars instead of three, in the

<sup>1</sup> Wiegmann, Arch. f. Nat. 1837, i. p. 127; Peters, Monatsb. Akad. Berlin, 1864, p. 44.

<sup>2</sup> Wiegmann, *ibid.*; Peters, *ibid.* Both this and the preceding species were omitted by Duméril and Bibron.

<sup>3</sup> Anderson, Proc. Asiat. Soc. Beng. 1871, p. 115.

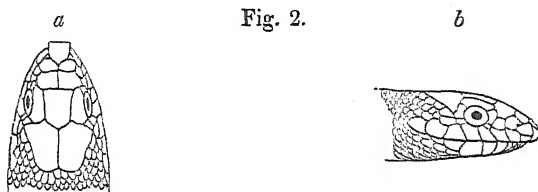
<sup>4</sup> Might not this have been distorted by being dried?

<sup>5</sup> I venture to suggest that this may be an improved form of the name proposed by Jan. Etym. *κατά* and *χλαῖνα*, a mantle (*καταχλαινώω*, I clothe).

fourth and fifth supralabials entering the orbit instead of the fifth only, in the shape of the vertical, which is pentagonal with straight instead of convex sides, in the greater number of ventral shields, and in the tail being one eighth only of the total length instead of about 1 : 6.5. As, however, the two forms have precisely the same coloration and are alike in other characters, it is not clear how far the peculiarities of the Persian form may be due to merely individual variation.

The genus *Catachlæna* may be thus defined:—

Head scarcely broader than the neck; body rounded; ventrals angulate; tail short, conical; pupil slightly elliptical, vertically elongate. Teeth in the upper jaw few in number, the last larger than the others and situated at a distance behind them.



Head of *Catachlæna diadema*, var.

Rostral peculiarly shaped, being sharply folded back upon the upper surface of the head, where it extends for a distance equal to the length of the postfrontals, and turned back at a still sharper angle laterally, so as to form part of the side of the head in front of the nasals. Nostril extremely small and subvalvular, between two shields.

I find this is not the first time that this Snake has been recorded from Persia; for Duméril and Bibron state that a specimen was brought thence by Aucher-Eloy<sup>1</sup>. Böttger records the same species from Jaffa, in Palestine.

The specimen from Southern Persia measures 18 inches, of which the tail is  $2\frac{1}{4}$ , and has 188 ventral shields and 36 pairs of subcaudals.

#### ZAMENIS DIADEMA.

Specimen without precise locality.

#### ZAMENIS CLIFFORDI.

Dehbid.

The specimen of *Z. diadema* is probably from Southern Persia, and agrees with most South-Persian specimens in having three small shields between the postfrontals and vertical. The ventrals are distinctly angulate. In the Snake from Dehbid, north of Shiráz, the

<sup>1</sup> The specimen is not now in the museum of the Jardin des Plantes. I made inquiries for it, as I wished to see whether it presented the same peculiarities as the other Persian individual above described.

postfrontals are in contact with the vertical, and the ventrals are not distinctly angulate. The two forms, however, are scarcely separable, as I have shown ('Eastern Persia,' ii. p. 413). The posterior maxillary tooth in the Dehbid specimen is but little if at all larger than those in front.

ZAMENIS VENTRIMACULATUS.

Bushire and Shiráz.

The specimen from Bushire is the ordinary Persian form with imperfect cross bands. That from Shiráz is Günther's var. C (*Z. rhodorachis*, Jan).

ZAMENIS CASPIUS.

Zargoom (I believe this to be Zirgán, 15 miles north-east of Shiráz).

The coloration is rather peculiar: each scale has a brown longitudinal band in the middle, and is pale on both sides. There are no spots on the back. The lower parts posteriorly are dull orange; probably in life they were bright orange or scarlet.

ZAMENIS RAVERGIERI.

One specimen from Dehbid.

TROPIDONOTUS HYDRUS.

The single specimen (which has no locality marked) is one of the exceptional individuals with but two præoculars.

CÆLOPELTIS LACERTINA.

Shiráz.

A large specimen over 5 feet in length, with only seventeen rows of scales round the body instead of nineteen. A young individual from Constantinople, also with only seventeen rows of scales, is figured by Jan.

\*HYDROPHIS CYANOCINCTA.

One specimen. Precise locality not marked.

This is doubtless from the Persian Gulf.

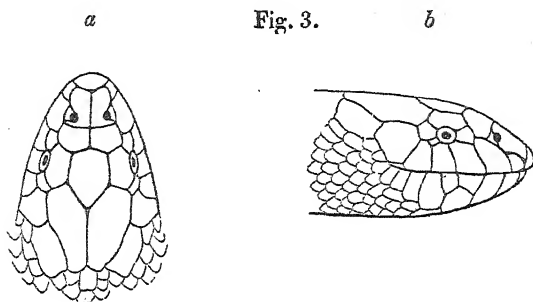
\*HYDROPHIS TEMPORALIS, sp. nov.

*H. capite mediocriter longo latoque, corpore longiusculo, squamis subimbricatis, post medium tuberculo minuto ornatis, in series 29 longitudinales paullo post caput, 33 in medio corpore ordinatis; scutis ventralibus 354, bituberculatis, fere æqualibus, squamas laterales duplo excedentibus, præanalibus 6; nasalibus longioribus quam lata, supralubialibus tertio quartoque infra oculum positis, temporalibus denique duobus utrinque maximis, margini externo cujusque occipitalis contiguis, anteriore altiore quam latum et fere vel omnino ad labium descendente. Dorsum maculis rhomboideis transversis circ. 35 ornatum, postice evanescentibus.*

Gangestun.

Head of moderate size and width. Neck and body slightly elon-

gate. Rostral broader than high. Nasals longer than broad and about half as long again as the frontals. Vertical nearly pentagonal, posterior angle rather less than a right angle. Each occipital almost once and a half the length of the vertical. The third and fourth labials are below the orbit; one præocular and one or two postoculars, there being two on one side and one on the other; two are probably normal, as the single shield is partly divided. Two

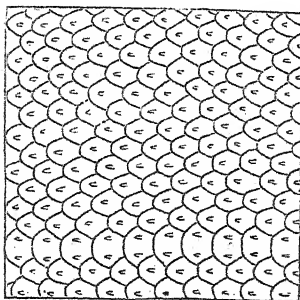


Head of *Hydrophis temporalis*.

very large temporals along the outer margin of each occipital; the anterior temporal is higher than broad, and descends nearly or quite to the gape. Two pairs of subequal chin-shields in contact with each other.

Scales slightly imbricate on neck, very slightly on body, not imbricate on upper portion behind; except on the anterior part of the

Fig. 4.



Scales of *Hydrophis temporalis*, near the middle of the body.

neck, each has behind the middle of its disk a minute tubercle. On the neck the scales are elongate, and they are longer than broad to considerably behind the middle of the body. Twenty-nine scales

round the neck a little behind the head, thirty-three round the middle of the body. Ventrals 354, nearly uniform in size, each about double the width of the adjoining scales, and bituberculate, except towards the head and close to the anus. Six præanal shields<sup>1</sup>. Terminal scale of tail considerably larger than the others.

About thirty-five diamond-shaped black spots on the back, each broader than long, becoming gradually fainter behind; head, sides, and belly yellow; a black spot at the end of the tail.

The only specimen is a male, and measures 66 inches, of which the head is 1 and the tail from anus  $4\frac{3}{4}$ . Circumference of neck 2.1 inches; of thickest part of body about 4.

The nearest species to this, so far as I can see, is *H. robusta*<sup>2</sup>, which is a stouter, less elongate form, with smooth ventrals, differently shaped and less elongate scales, those in the middle of the body being as high as they are broad, and having the tubercle subcentrally instead of posteriorly situated on each scale throughout the anterior part of the body. The anterior temporal is large; but there is no large posterior shield on the temple, and there are three shields along the outer margin of each occipital, instead of two. The vertical is pointed in front. The black rings in *H. robusta* extend completely round the body.

I have not been able to find the place named as the locality (Gangestún); it is doubtless on the shores of the Persian Gulf, and probably near Bushire.

#### VIPERA OBTUSA.

Tehran hills.

#### ECHIS CARINATA.

Muchberabad, 6 miles south of Bushire.

### 3. On a new Spider of the Family Theraphosidae. By the REV. O. P. CAMBRIDGE, M.A., C.M.Z.S., &c.

[Received May 13, 1881.]

(Plate LX.)

The chief interest attaching to this Spider lies in the fact of its having been received alive from Bahia, and having lived in the Gardens of the Society from the beginning of March to October 1880. It appears to have died soon after casting its skin, when it probably attained maturity; but upon this latter point it is impossible to speak with certainty, inasmuch as the cutting-open of the under-surface of the abdomen, in order to preserve the Spider, had destroyed

<sup>1</sup> Five only enter the anal margin; but I think six is the proper number.

<sup>2</sup> Schleg. Phys. Serp. ii. p. 505, pl. xviii. figs. 8-10; Günther, Rept. Brit. Ind. p. 364.

adult (both females), of the same species. One, received from Mr. Carl Hagenbeck, of Hamburg, on the 25th of March 1881, died on the 4th of the following month; the other, received from Mr. W. Cross, of Liverpool, on the 15th of July 1880, lived until the 31st of March 1881. Both these examples are from South America. One of them is rather darker, and the pubescence on the cephalothorax is of a more coppery reddish hue; but in other respects it agrees with the example described, though neither of them is quite so large.

#### EXPLANATION OF PLATE LX.

- Fig. 1. ♀ *Homocomma stradlingi* (from Dr. Stradling's specimen). Natural size.  
 2. The same. Profile of cephalothorax and falces, a little enlarged.  
 3. The same. Eyes from above and behind.  
 4. The same. Eyes from in front, looked at on a level with the Spider.  
 5. The same. ♂ from Brazil, right palpus, of natural size.  
 6. The same. Portion of right palpus enlarged, from above and behind, on the outer side.  
 7. The same. Portion of right palpus, from underneath.

4. On the Structure of the Pharynx, Larynx, and Hyoid Bones in the *Epomophori*; with Remarks on its Relation to the Habits of these Animals. By G. E. Dobson, M.A., M.B., &c.

[Received May 17, 1881.]

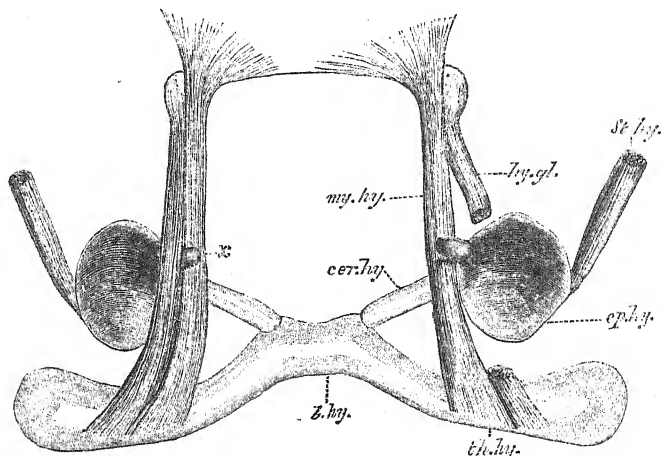
In all species of Chiroptera, of which the structure of the pharynx and larynx has hitherto been described, and in all those examined up to the present by the writer, the form of these parts has been found remarkably simple, differing but slightly from that of the Insectivora, all agreeing in possessing a short pharynx, with the small circular or narrow slit-like aperture of the larynx generally guarded by a short acutely-pointed epiglottis, which, in some genera (*Harpyia*, *Vampyrus*, e. g.), is almost obsolete, opening close behind the fauces, near to which also the posterior nares enter—and in the small size of the laryngeal cavity and feeble development of the vocal cords, the hyoid bone also being slender and connected by a chain of simple cylindrical bones with the cranium.

In the *Epomophori*, however, we find in the structure of all these parts a remarkable departure from the general type: the pharynx is long and very capacious, the aperture of the larynx far removed from the fauces; and opposite to it a canal leading from the narial chambers and extending along the back of the pharynx opens; the laryngeal cavity is spacious, and its walls are ossified; and the vocal cords are well developed; the hyoid bone is quite unconnected, except by muscle, with the cranium; the ceratohyals and epihyals are cartilaginous and greatly expanded, entering into the formation of the walls of the pharynx, and, in the males of two species at least,

supporting the orifices of the large posterior pair of air-sacs which extend beneath the integument of the sides of the neck<sup>1</sup>.

This peculiar development of the pharynx, larynx, and hyoid bones is well seen in *Epomophorus franqueti*. In that species the spacious cavity of the mouth opens into the wide and deep pharynx by a very restricted aperture, the inferior transverse diameter of which is not half the width of the tongue, and scarcely capable of

Fig. 1.



Hyoid bones and muscles of *Epomophorus franqueti* (enlarged).

*b.hy.* Basihyal bone with which the long thyrohyals, *th.hy.* are ankylosed (the latter are shown diagrammatically, as in nature they are hooked round the thyroid cartilage); *cer.hy.* ceratohyal bone; *ep.hy.* epihyal bone rotated forwards, showing its outer surface deeply concave for the neck of the posterior pharyngeal sac, and its prominent articular extremity (*x*) separating and acting as a pulley for the fleshy tendons (*my.hy.*) of the mylo-hyoid and (*hy.gl.*) hyo-glossus muscles; to its upper margin is attached the tendon (*st.hy.*) of the stylo-hyoid muscle.

admitting a hemp-seed, and which can evidently be completely closed by muscular action. In two male specimens the tip of the epiglottis is nearly three quarters of an inch from the fauces. The laryngeal walls are ossified, forming a large projection in the posterior

<sup>1</sup> The writer was unable to embody any part of these remarks in the introduction to his work on the Chiroptera (Catal. Chiropt. Brit. Mus. 1878) owing to the want of specimens available for anatomical examination. Lately, however, chiefly owing to the kindness of Drs. T. W. Wright and J. J. Lamprey, of the Army Medical Department, and Dr. Robb, of H.M.'s Indian Army, who forwarded well-preserved specimens of *Epomophori* from the west and east coasts of Africa, he has succeeded in obtaining most of the material which forms the basis of this paper.



third of the neck; and the wide space intervening between the epiglottis and the base of the tongue is seen, on removal of the integument, to be covered in by the mucous membrane of the pharynx only. The mylo-hyoid muscle arises on each side from the thyro-hyoid bone between the insertion of the sterno-hyoid muscle and the origin of the middle constrictor of the pharynx, and, suddenly narrowing, forms a half-round fleshy tendon, which passes forwards across the projecting articular extremity of the epihyal bone (fig. 1, *x*), which acts as a pulley, and on reaching the under

Fig. 2.

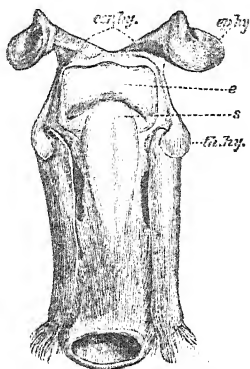


Fig. 3.

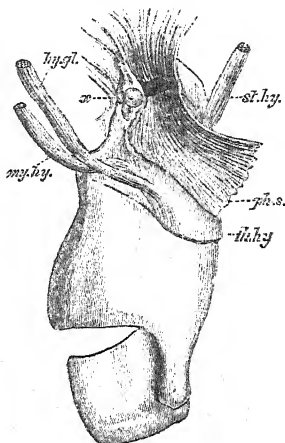


Fig. 2. Hyoid bones and larynx of *Epomophorus franqueti* (enlarged), viewed from above. *ep.hy.* epihyal bone; *cer.hy.* ceratohyal bones; *th.hy.* extremity of thyrohyal bone; *e*, epiglottis, posterior surface; *s*, Sanctorianian cartilages.

Fig. 3. Side view of part of the hyoid bones and the larynx of *Epomophorus franqueti* (enlarged), showing (*ph. s*) part of the neck of the posterior pharyngeal sac and its communication with the pharynx; *x*, the prominent articular extremity of the epihyal bone; *st.hy.* style-hyoid muscle; *my.hy.* mylo-hyoid, and *hy.gl.* hyo-glossus muscles, divided and drawn backwards; *th.hy.* thyrohyal bone.

surface of the tongue spreads out, uniting with its fellow of the opposite side to form a thin muscular expansion extending between the rami of the mandible almost as far forwards as the symphysis menti. Immediately external to the origin of the mylo-hyoid the hyo-glossus arises by a much narrower origin, and, forming a perfectly similar tendon, accompanies it forwards, but separated from it by the projecting articular extremity of the epihyal bone, and, curving inwards above it, is inserted into the side of the tongue. The genio-hyoid and genio-hyo-glossus muscles are absent, the basi-

hyal and ceratohyal bones being connected with the base of the tongue by the membranous walls of the pharynx alone.

The hyoid bone (figs. 1, 2, 3) is remarkably formed: the basihyal is ankylosed behind to a pair of long spatulate thyrohyals; in front it articulates on either side by a synovial joint, permitting very free rotatory motion, with a cartilaginous ceratohyal, which also articulates by its upper extremity with a large, very peculiarly shaped cartilaginous epihyal, which is circular in outline, having its inner side flat or slightly convex, its outer deeply concave from below backwards and upwards, and near its articular extremity a prominent external projection, across which the tendons of the mylohyoid and hyo-glossus muscles, above described, glide; the ceratohyal muscle extends from its posterior margin to the thyrohyal bone; and the stylo-hyoid muscle is inserted into its upper side. Its outer surface, as above described, is deeply concave in the adult male, and is lined by part of the neck of a sac, which extends outwards and backwards from the pharynx, under cover of the integument and the sterno-mastoid muscle, across the clavicle to the antero-inferior part of the thorax. Another sac, anterior to this, on each side of the neck, also extends outwards from the pharynx, and will be described further on (*vide infra*, fig. 4).

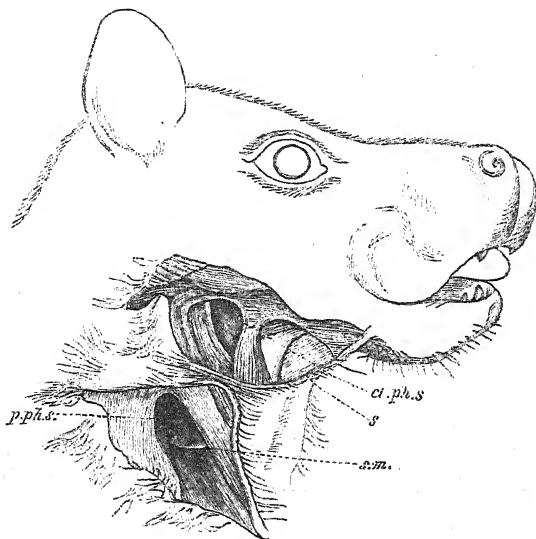
The walls of the evidently highly extensible pharynx are attached anteriorly to the base of the skull and to the back of the fauces and tongue (which is free between the hyo-glossi and stylo-glossi muscles; for there is no trace of genio-hyoid or genio-hyo-glossi muscles, and the body of the organ appears to be chiefly made up of a few muscular fibres with much interposed fat), extending forwards for some distance between its inferior surface and the mylo-hyoid expansion—posteriorly, to the anterior margins of the basi-, cerato-, and epihyal bones, and laterally, by an oblique ligamentous band, to the sterno-mastoid muscles. Immediately behind the mouth, in the adult male, are two large oval apertures (0·4 inch in antero-posterior diameter) in the sides of the pharynx, leading into a pair of large sacs, which extend outwards under cover of the integument beneath and behind the ears. The apertures open opposite each other; so that, if the sacs be cut open from without, the pharynx appears to be transfixed. These, which may be called the anterior pharyngeal sacs, are separated on each side of the neck from the posterior pharyngeal sacs (above described) by the sterno-mastoid muscle, and by a ligamentous septum passing inwards from it to the side of the pharynx, and outwards to the integument. Both pairs of sacs are absent in the female; their presence therefore indicates a secondary sexual character, of which the nearest analogue in Mammals appears to be the laryngeal sac of the Orang<sup>1</sup>.

<sup>1</sup> It is an interesting fact that the nearest known analogues of these pharyngeal sacs are to be found not among Mammals but in Birds, as in certain species of *Otis* and *Tetrao*. This might lead us to think that this peculiar secondary sexual character was in some way related to the volant powers of the animals. It must, however, be recollected that these birds are noted for their terrestrial habits.

The nasal cavities are brought into communication with the larynx by a long canal, which extends backwards along the spine and enters the pharynx directly opposite to the aperture of the larynx; so that the greater part of what we have called the pharynx would be evidently more correctly termed the isthmus faucium.

The walls of the larynx are ossified, enclosing a spacious cavity,

Fig. 4.



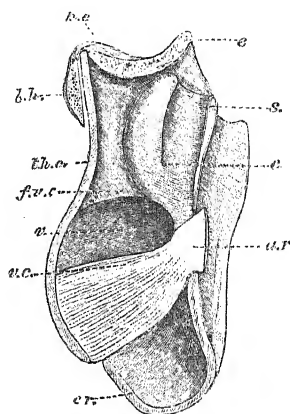
Head and neck of *Epomophorus franqueti* (ad. ♂, natural size).

The anterior (*a.ph.s.*) and posterior (*p.ph.s.*) pharyngeal sacs are opened from without, the dotted lines indicating the points where they communicate with the pharynx; *s*, thin membranous septum in middle line between the anterior pharyngeal sacs of opposite sides; *s.m.*, sternomastoid muscle separating the anterior from the posterior sac.

the anterior aperture of which (figs. 2 & 5) is protected by a very large epiglottis (*e*), which rests against the rounded anterior extremities of a pair of large crescent-shaped fibro-cartilaginous cushions (*c*), which extend forwards from the anterior margins of the triangular arytenoid cartilages (*a*). The true vocal cords are well developed and much longer than the false cords; the ventricles are spacious, and continued backwards between the true vocal cords and the thyroid, forming large sacculi, and forwards between the false vocal cords and the thyroid to its anterior margin, forming narrower but much longer "*sacculi laryngis*."

In *E. comptus* the structure of all the above-described parts is similar—with this exception only, that the tendons of the mylo-hyoid and hyo-glossus muscles pass forwards together below the epihyal process. No male specimens of *E. pusillus* are available for examination; but, judging from the anatomy of the female, it agrees in all respects with that of *E. comptus*. In *E. monstrosus*, which differs from all the other species in the absence of the shoulder-pouches, there are no posterior air-sacs; but the anterior sacs are well developed, and separated internally below, not by a thin parti-

Fig. 5.



Vertical and longitudinal section through the centre of the larynx of  
*Epomophorus franqueti* (enlarged).

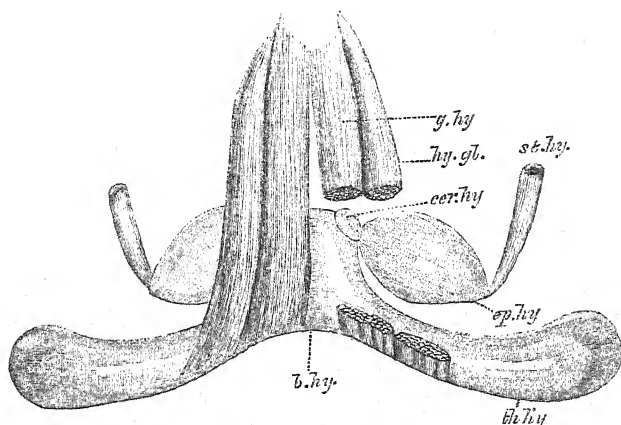
*e*, epiglottis; *h.e.*, hyo-epiglottideus muscle; *b.h.*, basihyal bone; *th.c.*, thyroid cartilage; *f.v.c.*, false vocal cord; *v.*, ventricle leading *anteriorly* into the long sacculus laryngis, extending almost as far as the base of the epiglottis, and *posteriorly* continued backwards behind *v.c.*, the true vocal cord; *ar.*, arytenoid cartilage; *s.*, apex of Santorinian cartilage; *c.*, crescentic fibro-cartilaginous cushion extending forwards from the arytenoid cartilage; *cr.*, cricoid cartilage.

tion as in the above-named species, but by an intermediate inferior sac communicating with the pharynx by an aperture between the mylo-hyoid tendons.

In *E. macrocephalus*, *gambianus*, *labiatus*, and *minor* the thyrohyals are very long, having their broad extremities bent inwards above so as to nearly meet in the middle line above the laryngeal opening; the basihyal (fig. 6, *b.hy*) is much produced forwards, terminating in a straight thin edge, to the outer sides of which the very short ceratohyals are attached by ligament only, and have a

very restricted backwards-and-forwards motion; the epihyals are lozenge-shaped, expanded, as in *E. franqueti*, but quite flat, and give attachment to the same muscles as in that species; but their infero-external extremities are not produced into prominent cornua as in that species; for there are no mylo-hyoids to support, the place of these muscles being taken by the united anterior bellies of the digastrics, which extend across as a thick muscular fold from side to side, and so far back as to cover the body of the hyoid bone, to which, however, it is not attached, being connected only with the superficial fascia extending backwards over the sterno-hyoid muscles.

Fig. 6.



Hyoid bones and muscles of *Epomophorus macrocephalus* (enlarged).

*b.hy*, basihyal bone; *th.hy*, thyrohyal bone; *cer.hy*, ceratohyal bone, small, almost ankylosed with the prominent anterior margin of the basihyal; *ep.hy*, epihyal bone, dislocated forwards, showing its flat, or very slightly concave, outer surface; *st.hy*, stylo-hyoid muscle; *g.hy* and *hy.gl*, genio-hyoid and hyo-glossus muscles passing forwards over the prominent anterior margins of the basihyal and ceratohyal bones.

On dividing and reflecting the digastrics the genio-hyoid muscles at once come into view, arising from the body of the hyoid bone posteriorly, and passing forwards over the prominent flat edge of its produced anterior part, as over a pulley, being there also supported on a pad of dense ligamentous tissue which occupies part of the space in front of the epiglottis, arising from the inner sides of the box-like compartment formed by the expanded hyoid bones, and extending also laterally outwards as a thick ligamentous band on each side across the articulation of the epihyal with the ceratohyal bone, and between the former and the fleshy tendon of the hyo-

glossus muscle. The small genio-hyo-glossi arise on each side from the anterior margins of the epihyals.

From the pharynx, thus closed in by osseous and muscular walls, no sacs extend outwards as in *E. franqueti*; but near the commencement of the œsophagus, opposite the opening of the larynx, there is the aperture of a single central sacculus, which lies between the middle constrictor of the pharynx and the spine, its neck passing between the fibres of that muscle, which forms a lozenge-shaped sphincter round it. It is difficult to suggest the office of this sac, the cavity of which in *E. macrocephalus* is not larger than a small bean, and in *E. minor* would hardly hold a pea.

Owing to the presence of the large inflected extremities of the thyrohyals, which nearly meet in the middle line across the commencement of the œsophagus; the inferior constrictors of the pharynx are much shorter, and do not form a pair of long fleshy tendons carried forwards longitudinally between the extremities of the epihyals as in *E. franqueti*; while the middle constrictors are distinguishable from them, and part of their fibres form a sphincter for the neck of the sacculus above described.

The remarkable form of the hyoid bones and great development of the isthmus faucium part of the pharynx, in which (though especially pronounced in the males of certain species) all the species agree, may be understood when we consider the nature of the food of these animals.

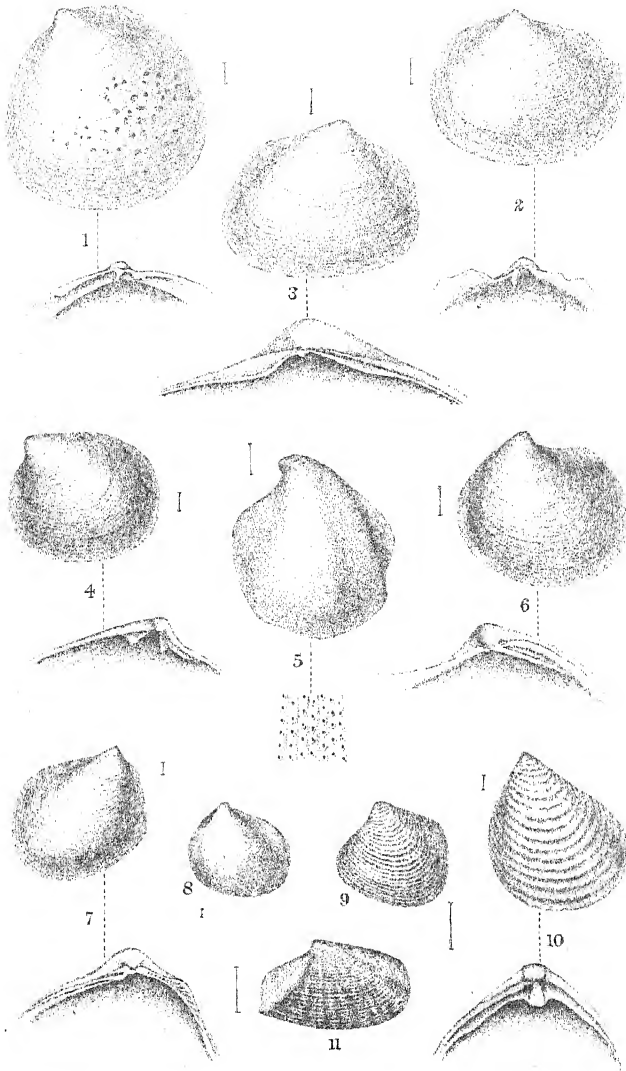
In the collection of the British Museum are specimens of *E. gambianus* from the banks of the Zambesi, with the note "eating figs" on the label attached to them by the donor Dr. Kirk. That figs constitute the food of *E. franqueti*, *macrocephalus*, *labiatus*, and *minor* also I have proved by finding remains of these fruits in the alimentary canals of these species.

The fig being a hollow receptacle containing numerous small fruits, is not easily detached from the branch for the purpose of mastication; and its outer rind is evidently too tough to be readily torn through by the feeble teeth of the *Epomophori*. The easiest method, therefore, of getting at its soft juicy contents is by sucking them out through the aperture at the distal extremity of the fig.

Now the whole structure of the mouth and pharynx of these animals is admirably suited for this purpose. The peculiarly voluminous lips are capable of completely encircling the fig, and their adherence to its smooth surface is evidently securely maintained by the soft pads which spring from their upper margins near the angles of the mouth. While thus encircled by the lips, the fruit is probably slowly chewed by the feeble acutely pointed teeth, and pressed upwards against the prominent palate-ridges so as to cause it to give up more freely its juices and soft contents, which are drawn out by suction through the terminal aperture.

The construction of the parts above described is specially suited to the action of suction, accomplished probably by the alternate action of the buccal muscles and the lungs. The spacious pharynx, shut off from the nasal apertures by the constrictors of the pharynx,





C. Bergeon del. et lith.

Bartholomew map.

MOLLUSCA OF THE "LIGHTNING" AND  
"PORCUPINE" EXPEDITIONS.



and from the mouth by the small valvular opening referred to, and having its sides supported behind by the expanded hyoid bones, constitutes a most perfect exhaustor; while the broad epiglottis, permanently folded over the larynx in front so that its aperture is directed upwards towards the spine, and the great size of the fibro-cartilaginous masses extending forwards from the arytenoid cartilages to the epiglottis (fig. 5, *c*, p. 690), effectually guard the glottis, preventing any part of the food, such as the small fig-seeds, from being drawn into the air-passages.

In the males of *E. monstrosus*, *franqueti*, *comptus*, and *pusillus*, permanent inflation of the pharyngeal sacs is rendered possible by the manner in which, as above described, the nasal and oral cavities are capable of being completely shut off from the pharynx. Considering the large size and position of the apertures by which these sacs communicate with the pharynx, it would appear at first sight that most of the food entering the pharynx must find its way into them. This difficulty is removed if we allow that suction by means of the inspiratory action of the lungs has any thing to do with drawing the semifluid food into the pharynx; for it is evident that the same action would cause the walls of the sacs to collapse inwards upon the apertures, and so close their communication with the pharynx at the very time when it was most needed.

5. On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868-70. (Part III.<sup>1</sup>) By J. GWYN JEFFREYS, LL.D., F.R.S., F.Z.S.

[Received May 20, 1881.]

(Plate LXI.)

CONCHIFERA (*continued*).

Family VIII. KELLIIDÆ.

1. PYTHINA SETOSA, Dunker.

*Coralliophaga setosa* (Dunker), Grube, Die Insel Lussin und ihre Meeresfauna, 1864, p. 48.

*Scintilla recondita*, Fischer, Les Fonds de la Mer, 1872, p. 49, pl. ii. f. 3.

'Porcupine' Exp. 1870: Atl. St. Tangier Bay; Med. 50, 50a.

*Distribution.* Arcachon to Mogador, Sicily, and Adriatic. Depths 5 to 86 fathoms.

*Fossil.* Pliocene: Monte Mario and Ficarazzi.

*Sportella caillati*, Conti, and *Kellia macandrewi*, Fischer. It belongs to *Pythina* in respect of the hinge as well as of the peculiar divaricating sculpture.

<sup>1</sup> For Part I. see P. Z. S. 1878, p. 393; for Part II. see P. Z. S. 1879, p. 553.

## 2. PYTHINA GEOFFROYI, Payraudeau.

*Erycina geoffroyi*, Payr. Cat. Corse, p. 30, pl. i. f. 3-5.

'Porcupine' Exp. 1870 : Atl. St. Vigo B.

*Distribution*. Bay of Biscay and Algiers.

*Fossil*. Pliocene : English and Belgian Crags.

*Corbula ambigua*, Nyst and Westendorff. The internal sculpture of the recent shell is very remarkable, and somewhat resembles that of *P. setosa*. It consists of numerous microscopic lines arranged lengthwise, but not radiating as in the latter species. Fossil specimens are opaque, and therefore do not show the sculpture above-mentioned.

## 1. LEPTON SQUAMOSUM, Montagu.

*Solen squamosus*, Mont. Test. Brit. i. p. 565.

*L. squamosum*, B. C. ii. p. 194, pl. iv. f. 7 ; v. p. 177, pl. xxxi. f. 2.

'Porcupine' Exp. 1869 : St. 9. 1870 : Atl. Vigo B.

*Distribution*. Norway to the Balearic Isles ; 8-70 fms.

*Fossil*. Pliocene : Coralline Crag, Monte Mario and Sicily.

The late Mr. Searles Wood proposed to unite the genera *Lepton*, *Lascea*, *Bornia*, *Scacchia*, *Scintilla*, *Kellia*, *Montacuta*, and *Sphegnalia* in one family under the name of *Fragillidæ*. The only reason given for this family union is that the shells are "small and tender." The present species has some obsolete generic and specific synonyms.

## 2. LEPTON NITIDUM, Turton.

*L. nitidum*, Turt. Conch. Dith. p. 63 : B. C. ii. p. 198 ; v. p. 177, pl. xxxi. f. 3.

'Porcupine' Exp. 1870 : Atl. St. Vigo B., 26, Tangier B. ; and var. *levis*. Med. : St. 55, Adventure Bank, var. *levis*.

*Distribution*. Norway to the Mediterranean and Adriatic ; 10-120 fms.

*Fossil*. Pliocene and Post-Tertiary : Norway, Great Britain, and Italy. Height 0-130 feet.

Differs in the degree and even in the absence of sculpture. The variety *levis* is perfectly smooth ; and I must correct or qualify my remark in the 'British Conchology' that this species is invariably sculptured.

## 3. LEPTON SULCATULUM, Jeffreys.

*L. sulcatulum*, Jeffr. in Ann. & Mag. Nat. Hist. 1859, p. 34, pl. 2. fig. 2a-g : B. C. ii. p. 201 ; v. p. 177, pl. xxxi. f. 3.

'Porcupine' Exp. 1870 : Atl. St. Tangier B. ; Med. Adventure Bank.

*Distribution*. England to Mediterranean and Adriatic, Canaries, and Korea ; laminarian zone to 130 fms.

Belongs to the genus *Neolepton* of Monterosato, and forms a sectional or subgeneric division of *Lepton*, as I suggested in 'British Conchology.'

4. *LEPTON LACERUM*<sup>1</sup>, Jeffreys.

*L. lacerum*, Jeffr., Les Fonds de la Mer, 1872, p. 84, pl. ii. f. 11, 11a.

SHELL roundish-oval, nearly flat, solid for its size, semitransparent, and glossy: *sculpture*, numerous close-set and very fine concentric striæ, which are stronger towards the front: *colour* clear white: *epidermis* inconspicuous: *margins* rounded at the sides and in front, but at the back exhibiting on each side of the beak, and at equal distances, a small spike-like projection, giving that part a jagged appearance: *beak* small, central, and semioval: *hinge-line* tricuspid, occupying about one sixth of the circumference of the shell: *cartilage-pit* narrow and perpendicular: *hinge-plate* broad and strong: *teeth* (in the only specimen here described), one small and obliquely placed cardinal, and a rather long ridge-like lateral, which is also placed obliquely on each side of the beak: *inside* glossy: *scars* slight. L. 0·1, B. 0·1125.

'Porcupine' Exp. 1870: Atl. St. 1. A single valve only.

*Distribution*. Bay of Biscay and Mediterranean; 35-70 fms.

This is a small shell; but I am at a loss to imagine why, on that account, the Editors of the excellent 'Journal de Conchyliologie' should have made the remark that as to such shells, "les caractères n'indiquent pas toujours avec certitude l'âge adulte."

*SCINTILLA ROTUNDA*<sup>2</sup>, Jeffreys. (Plate LXI. fig. 1.)

SHELL roundish, with an obliquely triangular outline, nearly flat, solid, opaque but glossy; *sculpture*, a few slight concentric lines of growth, which are more distinct towards the front, besides some minute irregular pit-marks as in other species of this genus: *colour* milk-white: *epidermis* none: *margins* gently rounded in front and at the sides, somewhat sloping from the beak on the left hand: *beak* minute, semiglobular or calyciform: *hinge-line* very short, obtusely triangular: *cartilage-pit* narrow and placed obliquely: *hinge-plate* also narrow: *teeth* (in the single valve here described) consisting of a minute cardinal, and of a ridge-like lateral on each side of the beak; the lateral tooth on the left side is much larger than the other, which commences with an angular point: *inside* polished, but slightly pitted: *scars* indistinct. L. 0·1, B. 0·1.

'Porcupine' Exp. 1870: St. 27.

*Distribution*. Palermo; 48-70 fms. (Monterosato, as *Vasconia rotunda*!).

The hinge of this species does not quite agree with the description of the genus *Scintilla* given by Messrs. Adams; but the remarkable texture of the shell is similar, viz. (to use their own words) "the external appearance of some of the species, which consists of a multitude of very fine punctations, of an opaque white colour, upon the shell, and which deprives them, in such portions, of their transparency." This peculiarity appears to be owing to the want of homogeneity in the composition of the shell.

<sup>1</sup> Torn.

<sup>2</sup> Round.

SCACCHIA TENERA<sup>1</sup>, Jeffreys. (Plate LXI. fig. 2.)

SHELL oval, thin, rather convex, semitransparent, of a dull hue : *sculpture*, numerous slight concentric striae, besides stronger and irregular lines of growth : *colour* whitish : *epidermis* filmy : *margins* rounded on all sides, except at the back, where it is uneven : *beaks* small, circular, projecting beyond the dorsal margin, slightly inclined to one side : *hinge-line* nearly straight : *cartilage-pit* small and narrow, placed obliquely under the beak ; *hinge-plate* rather broad but slight : *teeth*, in the right valve a small cardinal, in the left none except an angular projection below the beak enclosing the cartilage : *inside* polished : *scars* imperceptible. L. 0·175, B. 0·225.

'Porcupine' Exp. 1870 : St. 3a, 6, 16, 17a. A few valves only. An abnormal species of an eccentric genus.

DECIPULA<sup>2</sup>, Jeffreys.

SHELL oval, thin, glossy, completely closed : *cartilage* triangular, clasping and supporting the hinge : *teeth*, in one valve a minute cardinal, which lies below the beak, and is not easily seen, with a slight lateral on each side ; in the other valve none except a small angular projection of the hinge-plate on the right-hand side.

## DECIPULA OVATA, Jeffreys.

*D. ovata* (Jeffr.), Friele, Vid. Förh. 1875, p. 57 ; G. O. Sars, Moll. reg. arct. Norv. p. 341, t. 34. f. 1a-c (as *Tellimya ovalis*).

'Porcupine' Exp. 1869 : St. 18. A single valve.

*Distribution*. Lofoten Isles, W. Norway, and Bay of Biscay ; 120-552 fms.

It somewhat resembles *Montacuta ferruginosa* in shape ; but the hinge is generically different.

Brown's generic name *Tellimya* is a synonym of *Montacuta*, and includes *Kellia* also. The specific name *ovalis*, given by Prof. G. O. Sars, means belonging to an ovation or triumphal procession ; *ovata* means egg-shaped.

## 1. MONTACUTA FERRUGINOSA, Montagu.

*Mya ferruginosa*, Mont. Test. Brit. p. 44, t. 26. f. 5.

*Montacuta ferruginosa*, B. C. ii. p. 210 ; v. p. 178, pl. xxxi. f. 9.

'Porcupine' Exp. 1869 : St. 16, 18, 19, 35 (with variety *nivea*, which is more regularly oval ; and a longer monstrous valve, of a somewhat triangular shape, in consequence of the posterior margin sloping from the beak on each side instead of being rounded in that part), and off Belfast. 1870 : Atlantic, 6, 9, off Cape Espichel, off C. Sagres, 16 (valve of variety *nivea*, apparently a very old specimen, and having close-set and partly anastomosing marks of growth), 17A ; Mediterranean, Algeiras Bay, Adventure Bank.

*Distribution*. Greenland (*M. Sars*)?, arctic Norway to the Mediterranean and Adriatic, Mogador, Madeira, New England ; 3-733 fms.

<sup>1</sup> Tender.

<sup>2</sup> A deceiving thing.

*Fossil.* Pliocene and Post-tertiary: Norway, Great Britain and Ireland, N. France, and Italy; 0-80 ft.

Synonyms several. The variety *nivea* is the *Tellinmya nivea* of G. O. Sars, and corresponds with the variety *radiata* (*Syndosmya radiata*, Lovén) of *Scrobicularia alba*.

Mr. Marshall found this species and *M. substriata* at Guernsey attached to the spines of the same specimens of *Spatangus purpureus*—the former at the top, and the latter at the bottom or anal end. Moray Firth: of large size on the shore, smaller in deep water (*McAndrew*).

## 2. MONTACUTA PELLUCIDA<sup>1</sup>, Jeffreys. (Plate LXI. fig. 3.)

SHELL oval, convex, thin, transparent, and glossy: *sculpture*, strongly marked concentric lines of growth, and under the microscope minute irregular scratches arranged lengthwise: *colour* whitish, but partially clouded in consequence of the specimen being "dead" or not fresh: *margins* somewhat truncate at the posterior or smaller side, gently curved in front, expanded at the anterior side, and sloping from the beak on each side; *beaks* prominent, calyciform, placed nearly in the middle: *hinge-line* obtuse-angled, excavated in the middle, occupying rather more than one fourth of the circumference: *cartilage-pit* small, lying underneath the beak, with thickened edges: *hinge-plate* narrow and thin: *teeth* (in the only valve here described) consisting of a laminar lateral, which projects beyond the hinge-plate, on each side of the beak; that on the anterior side is twice as long as the other: *inside* glossy, plain-edged; *scars* slight. L. 0.15, B. 0.2.

'Porcupine' Exp. 1870: Mediterranean; St. Adventure Bank, a single valve.

Compare the above description with that of *M. ferruginosa* given in 'British Conchology.' The present species is oval instead of oblong, the posterior margin is not angulated, the beaks are prominent and placed nearly in the middle, and the cartilage-pit is much smaller.

## 3. MONTACUTA VÖRINGI, Friele.

*Montacuta* (?) *vöringi*, Friele, N. Mag. f. Naturv. xxii. B., 3. H. (separat-aftryck) p. 1, f. 1, 1a.

'Porcupine' Exp. 1869, St. 36. 1870: Atlantic, 9, 24, 26.

*Distribution.* Sognefiord, Norway, 630 fms. (*Friele*)!; Palermo, 87 fms. (*Monterosato*)!

Provisionally named by me *M. cuneata*. I have both valves; and I cannot see any generic difference in the hinge between this shell and *M. bidentata*, notwithstanding the remark of my friend Herr Friele, who described a single valve only.

## 4. MONTACUTA DONACINA, S. V. Wood.

*Montacuta*? *donacina*, S. V. Wood, Mon. Crag Moll. ii. p. 131, t. xi. f. 3, a-c; B. C. ii. p. 216; v. p. 178, pl. c. f. 4.

'Porcupine' Exp. 1869: St. Lough Swilly.

<sup>1</sup> Transparent.

*Distribution.* Falmouth, and St. Magnus Bay in Shetland; single valves (*J. G. J.*); Algiers (*Joly*), a perfect and living specimen!

*Fossil.* Pliocene: Coralline Crag, and variety as *M. cylindrica* (*Wood*)<sup>1</sup>; Fiume Oreto, Sicily (*Brugnone*)!

Allied to *M. substriata*; perhaps viviparous and quasi-parasitic or commensal, like that species. Mr. Wood proposed the generic name *Sphenaliu* for these and similar species.

#### 5. MONTACUTA SUBSTRIATA, Montagu.

*Ligula substriata*, Mont. Test. Brit. Suppl. p. 25.

*M. substriata*, B. C. ii. p. 205; v. p. 177, pl. xxxi. f. 6.

'Lightning' Exp. St. 2.

'Porcupine' Exp. 1869: St. 3, 10, 13, 14, 23a, North Channel. 1870: Mediterranean, off Rinaldo's Chair.

*Distribution.* Finmark to the Mediterranean and Adriatic; 2-250 fms.

*Fossil.* Pliocene and Post-tertiary: Norway, Coralline Crag, and Italy.

Inhabits the ventral spines of many kinds of Echinidæ. The fry is almost globular, like that of *Kellia suborbicularis*; and the beak is placed in the middle of the dorsal area.

There are several obsolete synonyms.

#### 6. MONTACUTA BIDENTATA, Montagu.

*Mya bidentata*, Mont. Test. Brit. p. 44, t. 26. f. 5.

*Montacuta bidentata*, B. C. ii. p. 208, pl. v. f. 1; v. p. 177, pl. xxxi. f. 8.

'Porcupine' Exp. 1869: St. 2, 9, 16, 17, 18, 18b, 19, Lough Swilly. 1870: Atlantic, 2, 13, 16, 17a, off Cape Sagres, 26, 30; Mediterranean, Algeiras Bay, 50, 55, G. Bona, Adventure Bank.

*Distribution.* Finmark and Faroe Isles to the Mediterranean, Adriatic and Archipelago, and Madeira; shore-100 fms.

*Fossil.* Pliocene and Post-tertiary: Norway, Sweden, Great Britain and Ireland, Belgium, and Italy; 0-130 ft.

Not *M. bidentata* of Gould, which is *M. elevata* of Stimpson. Nor is *M. truncata* of S. V. Wood (as I once supposed) a variety of the present species, although they are closely allied. *M. elliptica*, of the last-named author, appears to be a variety. Among the synonyms are *Arcinella laevis* of Philippi and *Mesodesma exiguum* of Lovén. In some specimens the layers of growth are so strongly marked as to form ridges.

#### 7. MONTACUTA OVATA<sup>1</sup>, Jeffreys. (Plate LXI. fig. 4.)

SHELL triangularly round, with a somewhat oblique outline, rather convex, moderately solid, lustreless: *sculpture* none, except irregular lines of growth: *colour* whitish: *epidermis* inconspicuous: *margins* abruptly truncate at the smaller or posterior side, distinctly curved in front, elevated and rounded on the anterior side: *beaks* small, inflected, with a deep indentation below; they are placed close to the

<sup>1</sup> Oval.

anterior side, which is scarcely one fifth the size of the other side: *hinge-line* rectangular, occupying about one fourth of the circumference of the shell: *hinge-plate* narrow: *teeth* in the right valve short, leaf-like and V-shaped; in the left valve laminar on each side: *inside* polished, with slight longitudinal striae towards the front: *scars* slight but large. L. 0.1, B. 0.1125.

'Porcupine' Exp. 1870: Atlantic, St. 24, 27, 30.

*Distribution.* Bay of Biscay ('Travailleur' Exp.), 628 fms. ! Algiers (Joly)!

*M. bidentata* is more elliptical and not so round, the beaks are not placed so near the anterior side, and the cardinal teeth are longer and more divergent.

## 1. *LASEA RUBRA*, Montagu.

*Cardium rubrum*, Mont. Test. Brit. p. 83, t. 27. f. 4.

*Lasea rubra*, B. C. ii. p. 219, pl. v. f. 2; v. p. 179, pl. xxxii. f. 1.

'Porcupine' Exp. 1869: St. Donegal B. 1870: Atlantic, Vigo B., Gibraltar B.

*Distribution.* Apparently world-wide, from Greenland (*coll. Möller in Mus. Copenhagen*) to St. Paul and Amsterdam islands (*Fischer*), in the Atlantic, and the Alaska Isles (*Stearns*) and Japan to the Strait of Magellan (*Philippi*), in the Pacific; shore-628 fms.

*Fossil.* Pliocene and Post-tertiary: Norway, England and Ireland, and Italy; 0-50 ft.

Several useless synonyms. Not *Kellia rubra* of Gould, which is *Cyamium minutum*.

M. Crosse, in a review of the second volume of 'British Conchology' (*Journal de Conchyliologie*, 3<sup>e</sup> sér. t. iv. no. 2, p. 202), says that, on my own showing, *Lasea* ought not to stand as the generic name, because Brown's diagnosis was insufficient, and Leach afterwards repudiated the name. But if a genus or species be described, although incompletely, in such terms as to leave no doubt as to what was meant, the name given to it by the describer takes precedence of another subsequent name, which is accompanied by a fuller description. In the present case, however, the subsequent description (that of Récluz) is worse than the first, and is likely to mislead. Brown, not Leach, was the author; and the latter had no right to repudiate or withdraw the original name without the consent of the author, who actually republished it in 1844.

## 2. *LASEA PUMILA*, S. V. Wood.

*Kellia pumila*, S. V. Wood, Crag Moll. (Bir.), p. 124, t. xii. f. 15, a, b.

'Porcupine' Exp. 1869: St. 15. 1870: Atlantic, 3, 8, 9, 13, 17A, 27, 28, 30.

*Distribution.* Bay of Biscay, Sicily, and Korea; 36-645 fms.

*Fossil.* Pliocene: Coralline Crag, and Sicily.

Monterosato proposed the generic name *Zoe* for this shell; but I do not consider it to be generically different from *Lasea*. At all

events *Zoe* was established by Philippi in 1840, and is still in use, for a genus of Crustacea.

*KELLIA SUBORBICULARIS*, Montagu.

*Mya suborbicularis*, Mont. Test. Brit. p. 39, t. 26. f. 6.

*Kellia suborbicularis*, B. C. ii. p. 225, pl. v. f. 3; v. p. 179, pl. xxxii. f. 2.

'Porcupine' Exp. 1869: St. 2, 25, Lough Foyle. 1870: Atlantic, 3, 3a, Vigo B., 26; Mediterranean, Benzert Road.

*Distribution*. Finmark to the Mediterranean and Adriatic, Canaries, Mazatlan, Indian Ocean, New England, and N.W. America: shore-205 fms.

*Fossil*. Pliocene and Post-tertiary: Norway, Great Britain and Ireland, and Italy.

Several synonyms. The delicate valves of this shell have been used with much success in imitating the petals of the hawthorn. Spanish nuns have long enjoyed a celebrity for shell flower-work; and there can be no reason why the nimble and artistic fingers of our own countrywomen should not be similarly employed.

#### Family IX. LUCINIDÆ.

##### 1. LORIPES LACTEUS, Linné.

*Tellina lactea*, L. S. N. p. 1119.

*Loripes lacteus*, B. C. ii. p. 233, pl. v. f. 4; v. p. 179, pl. xxxii. f. 4, 4a.

'Porcupine' Exp. 1870: Atlantic, St. Vigo B.

*Distribution*. Great Britain and Ireland to the eastern coasts of the Mediterranean, Black Sea, Adriatic, Morocco, Madeira, and Canaries; shore-628 fms.

*Fossil*. Pliocene: S. France, Italy, Asiatic Turkey, and Madeira. Post-tertiary: Calabria.

A southern form and an inhabitant of the littoral and laminarian zones. Several synonyms, including *Lucina leucoma* of Turton.

##### 2. LORIPES FRAGILIS, Philippi.

*Lucina fragilis*, Phil. En. Moll. Sic. i. p. 34; Chemn. Conch. Cab. vi. t. 13. f. 125 (as *Tellina lactea*, var.).

'Porcupine' Exp. 1870: Mediterranean, St. Benzert Road, Adventure Bank.

*Distribution*. Mediterranean, Adriatic, and Cape of Good Hope; 10-120 fms.

*Fossil*. Pliocene: Italy, Rhodes, and Madeira. Post-tertiary: Calabria.

There are a few unnecessary synonyms.

##### 3. LORIPES DIVARICATUS, Linné.

*Tellina divaricata*, L. S. N. p. 1120.

*Loripes divaricatus*, B. C. ii. p. 235; v. p. 179, pl. xxxii. f. 5.

'Porcupine' Exp. 1870: Mediterranean, St. Adventure Bank.



*Distribution.* South of England to the Mediterranean, Adriatic, Aegean and eastwards, Madeira, Canaries; "Tasmania and South Australia, common" (*Tenison-Woods*)?; 2-120 fms.

*Fossil.* Pliocene and Post-tertiary: Norfolk and Suffolk, Killiney near Dublin, Biot, Italy, and Madeira.

*Cardium discors* of Montagu, *Lucina commutata* of Philippi, and four other synonyms.

#### 1. LUCINA SPINIFERA, Montagu.

*Venus spinifera*, Mont. Test. Brit. p. 577, t. 17. f. 1.

*Lucina spinifera*, B. C. ii. p. 240; v. p. 179, pl. xxxii. f. 6.

'Porcupine' Exp. 1869: St. 2, 6, 9, 13, 18, 33, Little Minch, near Belfast. 1870: Atlantic, 9, Vigo B., 16, 17, Setubal B., 22, 25, off C. Sagres, 30; Mediterranean, 45, Cartagena B., 50, 55, Benzert Road, Adventure Bank, off Rinaldo's Chair.

*Distribution.* Nordland to the Sea of Marmora, Adriatic, Mogador, Madeira, Canaries, and Azores; 5-120 fms.

*Fossil.* Miocene, Pliocene, and Post-tertiary: Sweden, Caithness, and throughout Europe to Rhodes.

Very variable as to the number and size of the ridges. Eight synonyms.

#### 2. LUCINA BOREALIS, Linné.

*Venus borealis*, L. S. N. p. 1134.

*Lucina borealis*, B. C. ii. p. 242, pl. v. f. 5; v. p. 179, pl. xxxii. f. 7.

'Porcupine' Exp. 1869: St. 13, 14, 18, 25, 33, 35, 68. 1870: Atlantic, 9, 10, 29, 30, Tangier B.; Mediterranean, Capo de Gata, Adventure Bank.

*Distribution.* Vadsö and Faroe Isles to Sea of Marmora, Adriatic, Mogador, E. and W. coasts of North America (*P. Carpenter & Cooper*)?, Philippines (*Reeve*)?; low water-175 fms.

*Fossil.* Miocene, Pliocene, and Post-tertiary: Iceland, Norway and Sweden, Great Britain and Ireland, throughout continental Europe to Mogador and Rhodes, W. coast of N. America?; 0-150 ft.

A small variety inhabits brackish water in the Isle of Arran. Eleven synonyms.

#### 1. AXINUS FLEXUOSUS, Montagu.

*Tellina flexuosa*, Mont. Test. Brit. p. 72.

*Axinus flexuosus*, B. C. ii. p. 247, pl. v. f. 6; v. p. 179, pl. xxxiii. f. 1, 1a.

'Lightning' Exp. St. 1, 3 (var. *rotunda*). More circular and symmetrical, and not so globose, having the fold or groove very slight and only perceptible on the inside; perhaps a distinct species).

'Porcupine' Exp. 1869: St. 14 (var. *polygona*), 25 (same variety), 18, Lough Foyle, 35, 39, 62 (var. *rotunda*), 40 (var. *polygona*), Loch Torridon. 1870: Atlantic, 3 (var. *rotunda*), 9 (var. *sarsii*), 10 (var. *polygona*), Vigo B. (same variety), 13 (same va-

riety), 16 (var. *rotunda*), 17 (same variety), 17a (same variety), 22 (var. *rotunda*), 24 (var. *polygona*), off C. Sagres (same variety), 26-28a, 29 and 30 (var. *polygona*); Mediterranean, Cartagena B. (var. *polygona*), 50, off Jijeli, G. Bona, Rasel Amoush (var. *polygona*), G. Tunis, Adventure Bank.

*Distribution.* Spitzbergen, Siberian coasts, Iceland and Greenland to the Archipelago and Adriatic, Mogador, Canaries, Azores, Labrador to St. Thomas and Gulf of Mexico, Queen-Charlotte Islands, west coast of North America, and Korea; 2-1012 fms.

*Fossil.* Miocene, Pliocene, and Post-tertiary: Smith's Sound, Norway, Great Britain and Ireland, Belgium, France, Italy, Madeira, and United States; 0-80 ft.

Extremely variable in shape, size, and consistency; one of the numerous synonyms is *Cryptodon obesus* of Verrill. The variety *rotunda* resembles *Axinopsis orbiculata* of G. O. Sars, but is destitute of a cardinal tooth; that shell appears to be restricted to the arctic zone, and I dredged it at Holsteinborg, on the coast of Greenland, in 10 fathoms. *Lucina sinuosa* of Donovan, as described and figured by Hörnes, who referred it to the *Tellina flexuosa* of Montagu, is not the present species. Donovan's shell is *Thracia distorta*.

## 2. AXINUS ORBICULATUS, Seguenza. (Plate LXI. fig. 5.)

*Verticordia orbiculata*, Seg. Sulle Verticordie fossili del plioceno Italiano (R. Accad. d. Sc. fis. e matem., 1876), p. 9.

'Porcupine' Exp. 1869: St. 23. 1870: Atlantic, 3, 6, 25-30.

*Distribution.* Bay of Biscay ('Travailleur' Exp.), Naples and Sicily, Canaries; 49-645 fms.

*Fossil.* Pliocene: Calabria and Sicily.

*A. granulatus*, Jeffr. (MS.). Not *A. (Kellia) orbicularis* of Searles Wood, nor *Axinopsis orbiculata* of G. O. Sars.

This species is smaller than *A. flexuosus*, and is more triangular, with prominent beaks; and it has two ridges in the middle, and a remarkable granular epidermis.

## 3. AXINUS TORTUOSUS<sup>1</sup>, Jeffreys. (Plate LXI. fig. 6.)

SHELL oval, obliquely twisted to one side, convex, thin, glossy, and semitransparent; *sculpture*, irregular concentric lines of growth: *colour* pale yellowish-white: *epidermis* filmy: *margins* rounded in front and at the sides; below the beak, on the posterior side, that part of the margin is excavated; there is no fold or furrow on the anterior side: *beaks* prominent, pointed, and incurved: *lunule* narrow, with a thickened edge: *ligament* elongated, enclosed in a narrow groove: *hinge-line* obtusely angular, occupying about one third of the circumference: *hinge-plate* thick, containing the ligament: *teeth* none: *inside* glossy, exhibiting faint but numerous longitudinal striae: *pallial scar* narrow and distinct: *muscular scars* inconspicuous. L. 0.175, B. 0.2.

'Porcupine' Exp. 1870: St. off C. Espichel; a single valve.

*Distribution.* Bay of Biscay ('Travailleur' Exp.); 645-1012 fms.

<sup>1</sup> Twisted.

4. *AXINUS INCRASSATUS*, Jeffreys. (Plate LXI. fig. 7.)

*Axinus incrassatus*, Jeffr. in Ann. & Mag. N. H. Dec. 1876, p. 492.

'Porcupine' Exp. 1869 : St. 3 (var. *succisa*), 16, 23a, 25, 61. 1870 : Atlantic, 2, 8, 9, 17a, 24, 27-30 (all these stations having also the same variety) ; Mediterranean, Adventure Bank.

*Distribution*. 'Valorous' Exp., 'Shearwater' Exp. (var. *succisa*), 'Challenger' Exp., off Culebra I., St. Thomas ; 40-1785 fms.

Under the microscope, in certain lights, the hinge-plate appears to be minutely crenellated.

5. *AXINUS CROULINENSIS*, Jeffreys.

*Clausina croulinensis*, Jeffr. in Ann. & Mag. N. H. vol. xx. p. 19 ; ser. 3, ii. p. 122, pl. v. f. 2, a-c.

*A. croulinensis*, B. C. ii p. 250 ; v. p. 180, pl. xxxiii. f. 2.

'Lightning' Exp., St. 5, 7.

'Porcupine' Exp. 1869 : St. 3, 4, 5, 6, 15, 19, 21, 23, 25, 30, 31, 36. 1870 : Atlantic, 3, 6, 9, 10, Vigo B., 13, 16, 17a, 24, off C. Sagres, 29, 30.

*Distribution*. Loffoden Is. to Sicily, Madeira, Azores ('Challenger' Exp.) ; 30-1012 fms.

*Fossil*. Pliocene : Gedgrave, and Italy. Post-tertiary : Calabria.

*A. pusillus* of M. Sars.

6. *AXINUS EUMYARIUS*, M. Sars.

*Axinus eumyarius*, M. Sars, Christianiafjordens Fauna, ii. 1870 (posthumous), p. 87, t. 12. f. 7-10.

'Porcupine' Exp. 1870 : Atlantic, St. 3, 6, 9, 14, 17a, off C. Espichel, 29, 30 ; Mediterranean, 55.

*Distribution*. 'Valorous' Exp., Loffoden Isles to Christiania, Bay of Biscay ('Travailleur' Exp.), and Sicily : 40-1100 fms.

*Fossil*. Pliocene : Sicily.

*A. intermedius* of Monterosato is apparently the younger state of a variety in which the muscular impressions are very slight and scarcely perceptible.

7. *AXINUS FERRUGINOSUS*, Forbes.

*Kellia ferruginosa*, Forb. Brit. Assoc. Rep. 1844, p. 192.

*Axinus ferruginosus*, B. C. ii. p. 251 ; v. p. 180, pl. xxxiii. f. 4.

'Porcupine' Exp. 1869 : St. 3, 6, 13, 14, 17, 18, 25, 39, 47, The Minch. 1870 : Atlantic, 2, 3, 9, Vigo B., 13, 16, 17, 17a, 22, off C. Sagres, 25-34 ; Mediterranean, 45, Cartagena B., 55, Benzert Road, Adventure Bank, off Rinaldo's Chair.

*Distribution*. Novaya Zembla to the Morea and Adriatic, off the Azores ('Challenger' Exp.), Greenland, G. St. Lawrence, and New England : 20-1012 fms.

*Fossil*. Miocene : Calabria. Pliocene and Post-tertiary : Norway, Great Britain, and Italy.

The young is of an oblong shape, and is *Kellia transversa* of Forbes

and *A. oblongus* of Monterosato. Specimens dredged in the Swedish arctic Expedition of 1868, from 550 fathoms, are of a very large size. This corroborates Mr. Norman's statement, in his 'Notes on the Oceanic Copepoda' (Nares's 'Arctic Voyage'), viz.:—"With respect to size, we find here, as in many other instances among the Invertebrata, an extraordinary development of the Arctic specimens, which are at least *six times* the size of those from the Irish coast."

8. *AXINUS SUBOVATUS*<sup>1</sup>, Jeffreys. (Plate LXI. fig. 8.)

SHELL triangularly oval or wedge-shaped, nearly equilateral, rather convex, extremely thin, glossy, and semitransparent: *sculpture* none: *colour* whitish: *margins* sloping from the beak towards each end, somewhat truncate and angular on the anterior side, rounded on the posterior side, and gently curved in front: *beaks* small, prominent, recurved: *lunule* long and narrow, defined by a slightly raised ledge on both its sides: *ligament* narrow, somewhat projecting: *hinge-line* obtuse-angled: *hinge-plate* very narrow; *teeth* none, except a small point at the inner edge of the hinge-plate on the anterior side: *inside* polished: *scars* inconspicuous. L. 0.05, B. 0.075.

'Porcupine' Exp. 1869, St. 16, 30, 58.

*Distribution*. Bay of Biscay ('*Travailleur*' Exp.), 1300-1408 fms.

Differs from *A. ferruginosus* in its wedge-shaped appearance.

9. *AXINUS CYCLADIUS*, S. V. Wood.

*Kellia cycladia*, S. V. Wood, Crag Moll. (Biv.), p. 122, t. xi. f. 4, a, b: B. C. ii. p. 228; v. p. 179, pl. xxxii. f. 3.

'Porcupine' Exp. 1869: St. 19. 1870: Atlantic, 30.

*Distribution*. 'Valorous' Exp., Norway arctic Exp., Shetland, Falmouth and Lisbon telegraph-cable, Mediterranean, and Ægean: 30-1750 fms.

*Fossil*. Pliocene: Coralline Crag.

Variety *Kellia orbicularis*, S. V. Wood, which is certainly not *Scacchia ovata* of Philippi, as Mr. Wood doubtfully supposes.

1. *DIPLODONTA ROTUNDATA*, Montagu.

*Tellina rotundata*, Mont. Test. Brit. p. 71, t. 2. f. 3.

*D. rotundata*, B. C. ii. p. 254, pl. v. f. 7; v. p. 180, pl. xxxiii. f. 4, 4a.

'Porcupine' Exp. 1869: St. Galway B. 1870: Atl. C. Sagres; Med., Cartagena B., off Jijeli, Benzert Road, Rasel Amoush, Adventure Bank.

*Distribution*. British coasts to Ægean, Adriatic, Canaries, and Madeira; 0-60 fms.

*Fossil*. Miocene and Upper Tertiaries: Coralline and Red Crag, Belgium, S.W. France, Vienna Basin, Styria, Switzerland, Portugal, Italy, Greece, Rhodes, Cyprus, and Madeira. Post-tertiary: Calabria.

<sup>1</sup> Somewhat oval.

## 2. DIPLODONTA TRIGONULA, Bronn.

*Diplodonta trigonula*, Bronn, Ital. Tertiärgeb. (in Leonhard's Zeitschr. f. Mineral. p. 485), p. 96, t. 3. f. 2; Philippi, En. Moll. Sic. t. iv. f. 6 (as *D. apicalis*).

'Porcupine' Exp. 1870: Atl. St. Vigo B., C. Sagres, Tangier B. (var. *intermedia*); Med., Adventure Bank.

*Distribution*. Mediterranean, Adriatic, Ægean, Canaries, and Madeira; 4-120 fms.

*Fossil*. Miocene: Calabria. Upper Tertiaries: Coralline, Red, and Mammaliferous Crag, Belgium, Austrian Empire, Switzerland, Touraine, Italy, and Rhodes. Post-tertiary: Calabria.

Syn. and Vars. *D. astartea*, Nyst; *Tellina trigona*, Scacchi; *D. apicalis*, Philippi; *D. intermedia*, Biondi.

Variable in size and comparative breadth.

## Family X. CARDITIDÆ.

## 1. CARDITA ACULEATA, Poli.

*Chama aculeata*, Poli, Test. utr. Sic. ii. t. xxiii. f. 23.

'Porcupine' Exp. 1870: Atl. St. C. Sagres, 36, Tangier B.; Med. Capo de Gata, 50, Benzert Road, Rasel Amoush, Adventure Bank, off Rinaldo's Chair.

*Distribution*. Mediterranean, Adriatic, Ægean; 20-150 fms.

*Fossil*. Pliocene: France, Italy, Rhodes. Post-tertiary: Calabria. Several useless synonyms of Lamarck, Risso, Requier, and Reeve.

## 2. CARDITA CALYCVLATA, Linné.

*Chama calyculata*, L. S. N. p. 1138; Poli, Test. utr. Sic. ii. t. xxxii. f. 7-9.

'Porcupine' Exp. 1870: Atl. St. Cadiz Harbour; Med., Benzert Road.

*Distribution*. Mediterranean, Adriatic, Ægean, Syria, Mogador, Madeira, Senegal, Canaries, Azores; 0-120 fms.

*Fossil*. Miocene and Upper Tertiaries: S.W. and S. France, Austria, Italy, Rhodes, Cyprus, Madeira.

A few synonyms.

## 3. CARDITA CORBIS, Philippi.

*Cardita corbis*, Phil. En. Moll. Sic. i. p. 55, t. iv. f. 19.

'Porcupine' Exp. 1870: Atl. St. 26; Med. 50, 55, Adventure Bank.

*Distribution*. Bay of Biscay (*De Folin* and '*Travailleur*' Exp.), throughout the Mediterranean and Adriatic, Canaries; 6-552 fms.

*Fossil*. Upper Tertiaries: Coralline, Red, and Norwich Crags, Belgium, Touraine, Italy. Post-tertiary: Hopton, Calabria.

*C. minuta* of Scacchi, and *C. muculina* of Dujardin *vide* Wein-kauff.

## Family XI. CARDIIDÆ.

## 1. CARDIUM CILIARE, Linné.

*Cardium ciliare*, L. S. N. p. 1122.

*Cardium paucicostatum*, G. B. Sowerby, Conch. Ill. f. 20.

'Porcupine' Exp. 1870: Med. St. G. Bona (young), Benzert Road, Adventure Bank (valves and young).

*Distribution*. "La Manche" (*De Gerville*)?, N. Spain, Vigo Bay and Lisbon (*McAndrew*), S.W. France (*Fischer*), Mediterranean, Adriatic; 2-45 fms.

*Fossil*. Pliocene: S. France, Italy. Post-tertiary: Calabria.

Differs from the young of *C. aculeatum* in being thinner, more globose and oblique, having fewer ribs and stronger sculpture. It assuredly is not the young of *C. echinatum*. Reeve, in his 'Conchologia Iconica' has figured the present species as *C. ciliare* and *C. paucicostatum*.

## 2. CARDIUM ACULEATUM, Linné.

*Cardium aculeatum*, L. S. N. p. 1122: B. C. ii. p. 268; v. p. 180, pl. xxxiv. f. 1, 1a.

'Porcupine' Exp. 1870: Atl. St. 17 (fragment), Vigo B. (young); Med., 50 (young).

*Distribution*. British coasts, Bergen (*M. Sars*), Holland, France, Coruña, Mogador, Mediterranean, Adriatic; 4-20 fms. It is a southern form.

*Fossil*. Upper Tertiaries and Post-tertiary: Scotland?, Lancashire?, S. France, Italy, Morea.

As to the Bergen locality, it appears that there has always been a considerable trade in stock-fish between that and Mediterranean ports; and therefore the occurrence at Bergen of a single dead specimen of *C. aculeatum* must not be considered positive proof of its inhabiting the Norwegian seas. Mr. Norman also doubts the locality, because *Lepralia violacea*, a southern Polyzoon, is attached to the Bergen specimen of *Cardium*.

## 3. CARDIUM ECHINATUM, Linné.

*Cardium echinatum*, L. S. N. p. 1122: B. C. ii. p. 270; v. p. 181, pl. xxxiv. f. 2.

'Porcupine' Exp. 1869: St. 6 (young), 9, 10, 18, 24, 33, 35, 61. 1870: Atl. 10, Vigo B., C. Sagres (var. *deshayesi*), Tangier B. (var. *varispina*).

*Distribution*. Iceland, Faroe I., and Finmark southwards to the Sea of Marmora, Adriatic, Morocco, Madeira, Canaries; 0-100 fms.

*Fossil*. Upper Tertiaries: Austria, S. France, Italy, Algeria, Morea, Rhodes. Post-tertiary: Iceland, Scandinavia, British Isles; 0-600 ft.

Mr. Duprey tells me that this and many other bivalves which live between tide-marks, go out of the sand directly the tide begins to flow, especially when the weather is fine; a heavy shower stops their appearance.

Syn. *C. mucronatum*, Poli; his *C. echinatum*, as well as that of Bruguière, Olivi, Brocchi, and Basterot, is *C. erinaceum* of Lamarck. The *C. echinatum* and *C. ciliatum* of Fabricius are *C. islandicum* of Chemnitz. *C. deshayesii*, Payraudeau, is a pretty and remarkable variety of the present species. There are several other synonyms.

#### 4. CARDIUM ERINACEUM, Lamarck.

*Cardium erinaceum*, Lam. An. s. vert. vi. (1), p. 8; Poli, Test. utr. Sic. i. t. xvii. f. 4, 5 (as *C. echinatum*).

'Porcupine' Exp. 1870: Atl. St. C. Sagres (fragment).

*Distribution*. Mediterranean, Adriatic, Ægean.

*Fossil*. Pliocene: Sicily. Post-tertiary: Calabria.

The 'Porcupine' fragment indicates an extraordinary size. It is a portion of the posterior side; and the oblong wart-like tubercles resemble those of *Venus verrucosa*.

#### 5. CARDIUM TUBERCULATUM, Linné.

*Cardium tuberculatum*, L. S. N. p. 1122: B. C. ii. p. 273; v. p. 181, pl. xxxiv. f. 3.

'Porcupine' Exp. 1870: Med. St. 50.

*Distribution*. British seas to Egypt, Adriatic, Madeira, Canaries; 0-40 fms.

*Fossil*. Upper Tertiaries: S. France, Italy, Rhodes. Post-tertiary: British Isles, Calabria; 0-1200 ft.

Probably also *C. rusticum* of Linné, but not of Chemnitz.

#### 6. CARDIUM PAPILLOSUM, Poli.

*Cardium papillosum*, Poli, Test. utr. Sic. i. p. 56, t. xvi. f. 2-4: B. C. ii. p. 275; v. p. 181, pl. xxxv. f. 1.

'Porcupine' Exp. 1870: Atl. St. Vigo B., Setubal B., 22, 24, Tangier B.; Med. Algesiras B., 50, 55, Benzert Road, G. Bona, G. Tunis, Adventure Bank.

*Distribution*. Channel Isles to the Eastern Mediterranean, Adriatic, Mogador, Madeira, Canaries, Azores; 2-120 fms.

*Fossil*. Upper Tertiaries and Post-tertiary: Raised beach in Barnstaple Bay (*Prestwich*)!, Belgium?, Austrian Empire, S.W. and S. France, Italy, Greece, Rhodes, Cyprus, Madeira.

Several synonyms: Philippi's fossil species of this name from N.W. Germany is *C. kochi* of Semper.

#### 7. CARDIUM EXIGUUM, Gmelin.

*C. exiguum*, Gmel. S. N. (ed. xiii.) p. 3255: B. C. ii. p. 278; v. p. 181, pl. xxxv. f. 2.

'Lightning' Exp. St. 4, Faroe Banks.

'Porcupine' Exp. 1869: St. Donegal B. 1870; Med. 50, Adventure Bank.

*Distribution*. Finmark to E. Mediterranean, Adriatic, Black Sea; 0-120 fms.

*Fossil.* Upper Tertiaries : British Isles, S. France, Italy. Post-tertiary : Scandinavia, England and Ireland, and Calabria.

*C. pygmæum* of Donovan, and other synonyms. According to Mamo, Maltese specimens spin a byssus.

#### 8. *CARDIUM FASCIATUM*, Montagu.

*C. fasciatum*, Mont. Test. Brit. Suppl. p. 30 : B. C. ii. p. 281 ; v. p. 181, pl. xxxv. f. 3.

'Porcupine' Exp. 1869 : St. 2, 68.

*Distribution.* Iceland, Faroe Is., Siberian coasts, Vadsö to E. Mediterranean, Adriatic, Mogador, Canaries, Azores? ; 3-180 fms.

*Fossil.* Miocene : Calabria. Upper Tertiaries and Post-tertiary : Scandinavia, British Isles, Calabria ; 0-150 ft.

I give a few more particulars of the animal or soft parts.

Body pale yellowish-white : *mantle* thick, protruded considerably beyond the valves of the shell, scalloped on the anterior side : *tubes* very short, clothed with scattered white cirri of different lengths ; orifice of the lower or larger tube encircled by rather short and bluntly pointed stiff, equal-sized cilia ; orifice of the upper or smaller tube plain-edged, mamillar, and furnished with the usual hyaline valve : *foot* very extensile.

Synonyms numerous. I am inclined to regard *C. pinnulatum* of Conrad, a common North-American shell, as a variety of the present species ; the only difference seems to consist in the rather more oblique contour of *C. fasciatum*.

#### 9. *CARDIUM NODOSUM*, Turton.

*C. nodosum*, Turt. Conch. Dith. p. 186, t. 13. f. 8 : B. C. ii. p. 283 ; v. p. 181, pl. xxxv. f. 4.

'Porcupine' Exp. 1870 : Atl. St. 2, 6, C. Sagres, 30, Tangier B. ; Med. Algesiras B.

*Distribution.* Faroe Is., Hammerfest to Palermo, Adriatic ; 0-145 fms.

*Fossil.* Upper Tertiaries and Post-tertiary : Norway, Red and Norwich Crag, Ireland, S. France, Italy ; 0-130 ft.

*C. roseum* of Lamarek, and a few other more doubtful synonyms. There seems to be no use in trying to unravel the tangled skein of the synonymy of this and some of the foregoing species.

#### 10. *CARDIUM EDULE*, Linné.

*C. edule*, L. S. N. p. 1124 : B. C. ii. p. 286, pl. v. f. 9 ; v. p. 182, pl. xxxv. f. 5.

'Porcupine' Exp. 1869 : St. Galway B. (var. *rustica*), Donegal B. 1870 : Atl. Vigo B. ; Med. G. Tunis (var. *rustica*).

*Distribution.* All the coasts of Europe and N. Africa, from Iceland and Finmark to Egypt and Morocco, Caspian Sea, Canary Is. ; shore-10 fms.

*Fossil.* Miocene and Upper Tertiaries : throughout Europe, Rhodes, Cyprus, and the Sahara. Post-tertiary : Scandinavia, British Isles, Calabria ; 0-1360 ft.



There are at least a score of unnecessary synonyms; and, according to Graells, this common eatable shell-fish is known by fourteen local names in different parts of Northern Lusitania. The ancients imagined that such shell-fish were most in season if taken when the moon was full. A somewhat similar idea seems to have been entertained in our own times—so late indeed as the 17th century; for in Dryden's 'Wild Gallant' we find Justice Price boasting that he had in his larder "cocles, dainty fat cocles, that came in the night." The shells were then used for making lime. Ray, in his 'Itinerary,' 1662, says:—"After travelling on two miles further (from Laugharne, in Carmarthenshire) we saw them burning Cockle-shells, thereof to make Lime. The Manner thus. They make an Hole in the Ground, therein they put Furze, upon that Wood, upon the Wood small Stone Coal, and then a Layer of Cockle-shells, and so Shells and Coals, S. S. S. [stratum super stratum, as the editor Derham suggests], and then put Fire on them; these burnt make excellent Lime."

# 11. CARDIUM MINIMUM, Philippi.

*C. minimum*, Phil. Moll. Sic. i. p. 51; ii. p. 38, t. xiv. f. 18: B. C. ii. p. 292; v. p. 182, pl. xxxv. f. 6.

'Lightning' Exp. St. 2, 5.

'Porcupine' Exp. 1869: St. 1, 3, 6, 9, 10, 13, 14, 15, 18, 23 a, 47, 61, 65, Little Minch. 1870: Atl. 1, 2, 3, 9, Vigo B., 13, 16, 17, 17 a, Setubal B., 24, 25, C. Sagres, 26-30, 36; Med. 45, Cartagena B., 50, 51, 55, Benzert Road, Rasel Amoush, Adventure Bank, off Rinaldo's Chair.

*Distribution*. Siberian coast, Hammerfest to G. Egina, Adriatic, Ostend (*Malzine*)?; 5-645 fms.

*Fossil*. Upper Tertiaries and Post-tertiary: Scandinavia, Scotland, Italy, Rhodes; 0-130 ft.

Syn. See 'British Conchology,' ii. p. 293.

# 12. CARDIUM NORVEGICUM, Spengler.

*C. norvegicum*, Spengl. Skrivt. Selsk. v. pt. 1, p. 42: B. C. ii. p. 294; v. p. 182, pl. xxxv. f. 7.

'Porcupine' Exp. 1870: Atl. St. Vigo B., Setubal B., C. Sagres, Tangier B. (var. *rotunda*); Med. G. Bona, Benzert Road, Rasel Amoush (var. *oblonga*).

*Distribution*. Finmark and the Faroe Isles to the Eastern Mediterranean, Adriatic, Madeira, Canaries; 0-50 fms.

*Fossil*. Upper Tertiaries: British Isles, S. France, Italy. Post-tertiary: Scandinavia, England, Calabria: 0-1360 ft.

## Family XII. CHAMIDÆ.

### CHAMA GRYPHOIDES, Linné.

*C. gryphoides*, L. S. N. p. 1139; Poli, Test. Sic. ii. t. xxiii. f. 3, 4, 15, 20.

'Porcupine' Exp. 1870: Med. St. Capo de Gata, Cartagena B., Rasel Amoush (var. *dissimilis*), Adventure Bank. The variety *sinistrorsa* or *gryphina* occurred with the typical or usual form.

*Distribution.* C. Breton (*De Folin*), throughout the Mediterranean to Egypt, Adriatic, Canaries; 0-120 fms.

*Fossil.* Miocene and Upper Tertiaries: Coralline and Red Crag, Austrian Empire, Switzerland, S.W. and S. France, Algeria, Italy, Greece, Rhodes, Cyprus, Madeira. Post-tertiary: Calabria.

Syn. *C. gryphica* and *C. bicornis* (ex typ.), Linné, *C. sinistrorsa*, Brocchi (not Bruguière), *C. cavernosa*, Risso, *C. squamata* and several other so-called species of Deshayes, *C. circinata*, Monterosato.

### Family XIII. CYPRINIDÆ.

ISOCARDIA COR, Linné.

*Chama cor*, L. S. N. p. 1137.

*I. cor*, B. C. ii. p. 298, pl. vi. f. 1; v. p. 182, pl. xxxvi. f. 1, 1 a.

'Porcupine' Exp. 1869: St. 10, 13, 15, 16, 17, 19, 25, 30, 31, 40. 1870: Atl. 2, 3, 8, 9, 13, 16, 17, 17 a, C. Sagres, 26-30, 36; Med. Capo de Gata, 45, 50, 50 a, off Jijeli, 55, Rasel Amoush, Adventure Bank.

*Distribution.* N. Atlantic from Loffoden Is. to the Azores, Mediterranean, Adriatic, 'Valorous' Exp.; 4-1785 fms.

*Fossil*; adult and fry. Miocene and Upper Tertiaries: Coralline and Red Crag, Antwerp Crag, Continental Europe, S. France, Italy, Algeria, Greece, Asia Minor. Post-tertiary: Scandinavia, Calabria; 0-80 ft.

The fry or very young is the *Kellia abyssicola* of Forbes, *Venus? miliaris* of Philippi, and *Kelliella abyssicola* of Sars. I have occasionally found it with the adult, and could satisfy any one by showing him a complete and connecting series. The fry is nearly globular, white, smooth and glossy: the shape gradually and in course of growth changes to squarish; the colour becomes streaked with reddish-brown; and the surface is covered with a fine pilous epidermis, which is composed of short setæ arranged lengthwise in close-set rows. The adult is somewhat angular; and the epidermis is very thick and velvety, although still retaining the longitudinal setæ. In every state the shell is more or less tumid. The teeth are developed by degrees. In all probability the fry, when protruded from the ovary, swims or floats for a time on the surface of the sea, like the fry of the oyster, and thus occurs at all depths.

Hörnes has united with this species *I. lunulata* and *I. crassa* of Nyst, *I. rustica* of Conrad (from the American Miocene formation), and *I. fraterna* of Say. But these identifications require further examination.

CYPRINA ISLANDICA, Linné.

*Venus islandica*, L. S. N. p. 1131.

*C. islandica*, B. C. ii. p. 304, pl. vi. f. 2; v. p. 182, pl. xxxvi. f. 2.

'Porcupine' Exp. 1869: St. 2 (living), 9, 28, Lough Swilly, 58.

*Distribution.* Iceland to Arcachon, and N.E. America; 0-100 fms.

*Fossil.* Upper Tertiaries and Post-tertiary: Europe, Siberia, Baring Land, and N.E. America; 0-1360 ft.

1. *ASTARTE SULCATA*, DaCosta.*Pectunculus sulcatus*, DaCosta, Brit. Conch. p. 192.*A. sulcata*, B. C. ii. p. 311, pl. vi. f. 3; v. p. 183, pl. xxxvii. f. 1, 2.

'Lightning' Exp.: St. 1, 2, 5.

'Porcupine' Exp. 1869: St. 1, 3 (var. *minor*), 6, 9, 13, 14 (var. *minor*), 23a, 25, 33, 45, 45a, 45b, 62, 65, Little Minch. 1870: Atl. 1-3a, 8-10, 13, 22, 24, Setubal B., C. Sagres, 25-30 (and var. *levis*, which is squarish, convex, and ribless or smooth), Tangier B.; Med. Capo de Gata, Cartagena B., 50, Adventure Bank, off Rinaldo's Chair. All these last belong to the varieties *minor* and *fusca* or *incrassata*.*Distribution*. Spitzbergen to the Eastern Mediterranean and Adriatic, Siberia, E. Greenland, N.E. America, G. Mexico, Canaries; 3-400 fms.*Fossil*. Upper Tertiaries and Post-tertiary: Siberia, Scandinavia, G. Britain, S. France, Italy, Rhodes, N.E. America; 0-1360 ft.This is a most polymorphous and puzzling species, as regards shape, size, sculpture, and other characters. Two of the most noteworthy varieties are *Tellina fusca* of Poli = *Venus incrassata*, Brocchi, and *Crassina elliptica* of Brown; the former has a southern, and the latter a northern habitat. The crenulation of the inner margin is by no means indicative of full growth. *Venus gallina* and many other species of that genus possess the same character in all states of growth. The late Dr. Mörch referred the variety *elliptica* to *Venus compressa* of the 'Mantissa plantarum'; but the description, or rather diagnosis, in that work is much too indefinite for such identification, and no habitat is given. If this were not so, *compressa* would take precedence of *sulcata* as the specific name.2. *ASTARTE ACUTICOSTATA*, Jeffreys. (Plate LXI. fig. 9.)*A. acuticostata* (Jeffr.), Friele, Nyt Mag. f. Naturvid. 1877, separate copy, p. 1.

'Lightning' Exp. St. 1, 3.

'Porcupine' Exp. 1869, St. 65.

*Distribution*. Norwegian arctic Exp., 259-650 fms.; Novaya Zembla (*Leche*); Osterfiord, W. Norway (young), 200 fms.Although I have proposed to constitute this as a distinct species, I have some misgivings that it may be only another well marked variety of that protean species, *A. sulcata*. Its characteristic differences consist not merely in its dwarf size and numerous ribs, but in its rhombic shape, as well as in the ribs being sharp and more or less laminar or imbricated, and in the dorsal margin being straight. The inner margin is plain.3. *ASTARTE CRENATA*, Gray.*Nicania crenata*, Gray in Suppl. App. Parry's 1st Voyage (1824), p. cxxlii.

*A. crebricostata*, B. C. ii. p. 319 : v. p. 183 : G.O. Sars, Moll. reg. arct. Norv. t. 5. f. 7, *a*, *b*.

'Porcupine' Exp. 1869 : St. The Minch (semifossil).

*Distribution*. Arctic seas from Tromsø northwards, Siberian coast, N.E. America from Maine northwards, 'Fox' Exp., 'Valorous' Exp., Norwegian arctic Exp., Dutch arctic Exp. ; 5-500 fms.

*Fossil*. Post-tertiary : Great Britain, Scandinavia, Siberia ; 10-1360 ft.

Syn. *Crassina depressa*, Brown, *A. crebricostata*, Forbes, *A. crebrilirata*, S. Wood (young), *A. richardsoni*, Reeve, *A. lens*, Stimpson MS.

May be known by its depressed and triangular shape and its numerous ribs ; but I have specimens which seem to unite it with *A. sulcata*. The typical form is smaller, inclined to oblong, and more convex. Variable to some extent. Of two fossil valves from Bridlington of the same size one is plain edged, and the other has the inner margin notched.

#### 4. ASTARTE COMPRESSA, Montagu.

*Venus compressa*, Mont. Test. Brit. Suppl. p. 43, t. 26. f. 1.

*A. compressa*, B. C. ii. p. 315 ; v. p. 183, pl. xxxvii. f. 3, 4.

'Porcupine' Exp. 1869 : St. Loch Torridon (var. *warhami*, semifossil). 1870 : C. Sagres (var. *semistriata*, valves).

*Distribution*. N. Atlantic from Spitzbergen and Novaya Zembla to the Dogger Bank and New England, Vancouver I. (*P. Carpenter*, as *A. compacta*) ? The typical form is arctic, Scandinavian, Hebridean, and N. American ; the variety *globosa* is also arctic ; var. *striata* is arctic and northern, but reaches the Yorkshire coast. 3-2000 fms.

*Fossil*. Upper Tertiaries, and more especially Post-tertiary : Siberia, Scandinavia, G. Britain and Ireland, N.E. America (mostly var. *striata*), Nice (*Risso*, as *Cyprina montagui*) ? ; 0-1360 ft.

Not less variable than *A. sulcata*, and consequently having many synonyms. The typical or smooth form is *Nicania banksii* of Leach. My variety *globosa* is not Möller's species of that name, but agrees with a specimen from the collection of the late Mr. Albany Hancock, which was named by him *A. warhami*. The *A. sulcata* of Gould (fig. 45) represents this last variety.

#### 5. ASTARTE TRIANGULARIS, Montagu.

*Maetra triangularis*, Mont. Test. Brit. p. 90, t. 3. f. 5.

*A. triangularis*, B. C. ii. p. 318 ; v. p. 183, pl. xxxvii. f. 5.

'Porcupine' Exp. 1870 : Atl. St. Vigo B., C. Sagres, 26, 36 ; Med. Algesiras B., Cartagena B., 50, Benzert Road, Adventure Bank (var. *subtrigona*.)

*Distribution*. Shetland to G. Egina, Adriatic, Canaries (var. *parvula*) ; 0-205 fms.

*Fossil*. Upper Tertiaries : British Isles, Belgium, Vienna Basin, S.W. France, Italy. Post-tertiary : Norway, Calabria.

Synonyms several. " Gregarious in fine shelly sand at low water

of spring tides" (*Duprey*). Inner margin notched or plain, irrespectively of size and apparent age.

6. *ASTARTE PUSILLA*, Forbes. (Plate LXI. fig. 10.)

*A. pusilla*, Forb. Br. Assoc. Rep. 1843 (1844), p. 192.

'Porcupine' Exp. 1870: Atl. St. C. Sagres, 26, 36; Med. Adventure Bank.

*Distribution*. Ægean, 70-112 fms. (*Forbes*), Palermo (*Monterosato*), Tunisian coast, 50-100 fms. (*Nares*), east of Malta, 310 fms. (*Spratt*), 'Shearwater' Exp., 40-120 fms.

Allied to *A. parva* (afterwards *forbesii*) of Searles Wood from the Coralline Crag; but the concentric striæ in that species are oblique.

7. *ASTARTE DIGITARIA*, Linné.

*Tellina digitaria*, L. S. N. p. 1120.

*Woodia digitaria*, B. C. ii. p. 238; v. p. 179, pl. c. f. 6.

'Porcupine' Exp. 1870: Atl. St. Vigo B., 22, C. Sagres, 26-28a, 36, Tangier B., Gibraltar; Med. Algesiras B., 50, Benzert Road, Rasel Amoush, Adventure Bank.

*Distribution*. Cornwall (valves) southwards to E. Mediterranean and Adriatic; 10-600 fms.

*Fossil*. Upper Tertiaries: British Isles, Belgium, S.W. France, Italy. Post-tertiary: Calabria.

I cannot separate the genus *Woodia*, of which this species is the type, from *Astarte* by any distinct character. The hinge and teeth are certainly the same; and the pallial and muscular scars agree. The present species varies in the comparative number of striæ. Some of my specimens are quite triangular. Single valves occurred in great abundance off Cape Sagres and in Benzert Road.

8. *ASTARTE BIPARTITA*, Philippi.

*Lucina? bipartita*, Phil. En. Moll. Sic. i. p. 32, t. iii. f. 21.

'Porcupine' Exp. 1870: Atl. St. C. Sagres, 26; Med. 50, Benzert Road, Adventure Bank.

*Distribution*. Mediterranean and Adriatic; 10-120 fms.

*Fossil*. Upper Tertiaries: Italy, Rhodes. Post-tertiary: Calabria.

An exquisitely sculptured shell.

*CIRCE MINIMA*, Montagu.

*Venus minima*, Mont. Test. Brit. p. 121, t. 3. f. 3.

*Circe minima*, B. C. ii. p. 322, pl. vi. f. 4; v. p. 183, pl. xxxvii. f. 6.

'Porcupine' Exp. 1869: St. Little Minch. 1870: Atl. Vigo B., Setubal B., C. Sagres, 26, 30, 36, Tangier B.; Med. Cartagena B., 50, Adventure Bank, off Rinaldo's Chair.

*Distribution*. Bergen to E. Mediterranean, Adriatic, Madeira, Canaries; 4-205 fms.

*Fossil*. Miocene: Vienna Basin, Transylvania, Switzerland, PROC. ZOOL. SOC.—1881, No. XLVI. 46

Calabria. Upper Tertiaries: Coralline and Red Crag, Belgium (*Nyst*, as *Cytherea trigona*), S. France, Italy, Greece, Rhodes. Post-tertiary: Calabria.

#### Family XIV. VENERIDÆ.

##### 1. VENUS EXOLETA, Linné.

*Venus exoleta*, L. S. N. p. 1134: B. C. ii. p. 327; v. p. 184, pl. xxxviii. f. 1.

'Porcupine' Exp. 1869: St. Galway B.

*Distribution.* Finmark to the Morea and Adriatic; 0-50 fms.

*Fossil.* Miocene and Upper Tertiaries: throughout Europe from England to Greece, Rhodes, and Cyprus. Post-tertiary: Norway, Calabria; 0-50 ft.

##### 2. VENUS LINCTA, Pulteney.

*V. lincta*, Pult. in Hutch. Dors. p. 34: B. C. ii. p. 330; v. p. 184, pl. xxxviii. f. 2.

'Porcupine' Exp. 1869: St. 1, 9, 10, 14, 18, 35, The Minch. 1870: Atl. 10, Vigo B. (var. *lupinus*), C. Sagres, Tangier B.; Med. Algesiras B., 50, Benzert Road, Adventure Bank (all these belong to the variety *lupinus*).

*Distribution.* Iceland, Faroe Is., arctic Norway to the coast of Syria, Adriatic, Morocco; 0-90 fms.

*Fossil.* Miocene: Vienna Basin and Switzerland. Upper Tertiaries and Post-tertiary: Norway, British Isles, Belgium, S.W. and S. France, Italy, Greece, Rhodes; 0-130 ft.

*V. exoleta* β, Linné. Dr. Mörch must have been mistaken in considering the present species *V. spuria* of Gmelin, which latter was founded on Lister's and Chemnitz's figures of *Lucina borealis*. There are numerous synonyms, including *V. lupinus* of Poli, and *Cytherea lunaris* of Lamarck.

##### 3. VENUS RUDIS, Poli.

*V. rudis*, Poli, Test. utr. Sic. ii. p. 94, t. 20. f. 15, 16.

'Porcupine' Exp. 1870: Atl. St. 10, Setubal B., C. Sagres, 26, 29, 36, Tangier B., Gibraltar B.; Med. 45, Capo de Gata, Cartagena B., 50, off Jijeli, G. Bona, Benzert Road, Rasel Amoush, Adventure Bank, off Rinaldo's Chair.

*Distribution.* Bay of Biscay to E. Mediterranean and Sea of Marmora, Black Sea, Adriatic, Canaries; 2-120 fms.

*Fossil.* Upper Tertiaries: Coralline, Red, and Norwich Crag, Belgium, S. France, Cos, Italy, Rhodes, Madeira. Post-tertiary: "Middle Glacial" at Hopton, Calabria.

Nine synonyms.

##### 4. VENUS EFFOSSA, Bivona.

*Venus effossa* (Biv. MS.), Philippi, En. Moll. Sic. i. p. 43, t. iii. f. 20.

'Porcupine' Exp. 1870: Med. St. 50 (valve only).

*Distribution.* Mediterranean from Marseilles to Sicily; 50-190 fms.

*Fossil.* Upper Tertiaries: Sicily. Post-tertiary: Calabria.

# 5. VENUS MULTILAMELLA, Lamarck.

*Cytherea multilamella*, Lam. An. s. Vert. v. p. 581.

*Venus nux*, Hidalgo, Moll. mar. Esp. Port. y las Bal., lam. 22. f. 5, 23. f. 1.

'Porcupine' Exp. 1870: Atl. St. Setubal B., C. Sagres (abundant); Med. Capo de Gata, 50, 50 a, Benzert Road, Rasel Amoush, Adventure Bank.

*Distribution.* Mediterranean from Algiers to Sicily; 54-120 fms.

*Fossil.* Miocene: Vienna Basin, Hungary, Switzerland. Upper Tertiaries: Belgium, S. France, Italy, Algeria, Cos, Rhodes, Cyprus, Madeira.

Syn. *V. rugosa*, Brocchi and Bronn (not Linné), *V. multilamellosa*, Nyst, *V. boryi*, Deshayes, *V. lamellosa*, Rayneval, *V. cygnus*, Weinkauff (not Lamarck). Gmelin cites for his *V. nux* Bonanni's figure of *V. verrucosa*.

# 6. VENUS CASINA, Linné.

*Venus casina*, L. S. N. p. 1130: B. C. ii. p. 337; v. p. 184, pl. xxxviii. f. 5.

'Lightning' Exp.: St. 4.

'Porcupine' Exp. 1869: St. The Minch. 1870: Atl. 3 a, Setubal B., C. Sagres, 26, Tangier B.; Med. Capo de Gata.

*Distribution.* Vardø to Mediterranean and Adriatic, Madeira, Canaries; 0-145 fms.

*Fossil.* Upper Tertiaries: Great Britain, S. France, Italy, Archipelago. Post-tertiary: Norway, England, Calabria; 0-1360 ft.

# 7. VENUS FASCIATA, Da Costa.

*Pectunculus fasciatus*, Da C. Brit. Conch. p. 188, t. xiii. f. 3.

*Venus fasciata*, B. C. ii. p. 334, pl. vi. f. 5; v. p. 184, pl. xxxviii. f. 4.

'Lightning' Exp. St. 5.

'Porcupine' Exp. 1869: St. The Minch. 1870: Atl. Vigo B., Setubal B., 22, 26, C. Sagres, 36; Med. 50, Adventure Bank.

*Distribution.* Havörsund near N. Cape to G. Egina, Bosphorus, Adriatic, N. Japan; 0-130 fms.

*Fossil.* Upper Tertiaries: Great Britain, S. France, Italy, Rhodes. Post-tertiary: Norway, Calabria; 0-40 ft.

One of the numerous varieties is *V. brongniarti*, of Payraudeau, which my friend Monterosato prefers considering a distinct species. If he were right, other varieties would be equally entitled to specific distinction, and the word variety might be expunged from the dictionary of Natural History.

## 8. VENUS GALLINA, Linné.

*Venus gallina*, L. S. N. p. 1130: B. C. ii. p. 344; v. p. 184, pl. xxxix. f. 2, 3.

'Porcupine' Exp. 1869: St. 2, 6, 9, 18, 19, Lough Swilly, L. Foyle, off Lerwick. 1870: Atl. 10, 13, Vigo B., C. Sagres, Tangier B. All the above are var. *striatula*. Med. Algesiras B., 45 (var. *striatula*), 50, off Rinaldo's Chair (var. *striatula*).

*Distribution*. Iceland and Vadsö to E. Mediterranean, Port Said, Black Sea, Caspian, Adriatic, Mogador, N. Japan; 0-120 fms.

*Fossil*. Upper Tertiaries and Post-tertiary: Norway, British Isles, S.W. and S. France, Italy, Algeria, Morea; 0-1360 ft.

Mr. McAndrew says that he found at Algiers the typical form living on the shore, and in 30 fathoms the variety *striatula*.

## 9. VENUS OVATA, Pennant.

*Venus ovata*, Penn. Brit. Zool. iv. p. 97, pl. 56. f. 56: B. C. ii. p. 342; v. p. 184, pl. xxxix. f. 1, 1 a.

'Lightning' Exp.: St. 3, 5, 7.

'Porcupine' Exp. 1869: St. 1, 2, 6, 13, 14, 18, 19, 23 a, 25, 35, 61, 62, Little Minch, off Lerwick. 1870: Atl. 3, 9, 10, 13, Vigo B., 16, Setubal B., 22, 24, C. Sagres, 25-28, 36, Tangier B.; Med. 45, Capo de Gata, Cartagena B., 50, 50 a, 55, Benzert Road, Rasel Amoush, Adventure Bank.

*Distribution*. Vadsö to E. Mediterranean, Sea of Marmora, Bosphorus, Adriatic, West coast of Africa (*Deshayes*)?; 0-1083 fms.

*Fossil*. Miocene: Austrian Empire and Switzerland, Calabria. Upper Tertiaries: Coralline Crag, Belgium, S.W. and S. France, Italy, Greece, Rhodes, Algeria, Madeira. Post-tertiary: Scandinavia, British Isles, Calabria; 0-106 ft.

Synonyms. Nearly a dozen, from Walker (1784) to Leach (1852).

## 10. VENUS CHIONE, Linné.

*Venus chione*, L. S. N. p. 1131: B. C. ii. p. 332; v. p. 184, pl. xxxviii. f. 4.

'Porcupine' Exp. 1870: Atl. St. C. Sagres; Med. Algesiras B., 50, Benzert Road, Adventure Bank.

*Distribution*. S. and W. England, Wales, and Ireland to Egypt, Adriatic, Madeira, Canaries, Azores; 0-120 fms. "Carnarvon Bay, with *Cyprina islandica*, burrowing in the sand at extreme low water, not more than an inch below the surface, leaving a small slit in the sand over the ventral margin of the shell" (*Robertson*).

*Fossil*. Upper Tertiaries: Belgium, S. France, Italy, Morea, Rhodes, Cyprus, Madeira. Post-tertiary: England, Calabria; 0-1200 ft.

## VENERUPIS IRUS, Linné.

*Donax irus*, L. S. N. p. 1128.

*Venerupis irus*, B. C. iii. p. 86, pl. iii. f. 4; v. pl. ii. f. 5.

'Porcupine' Exp. 1869: St. The Minch (young).



*Distribution.* S. England, Bristol Channel, E., W., and S. Ireland, Atlantic coasts of France and Spain, Mogador, throughout the Mediterranean, Black Sea, Adriatic, Madeira, Canaries; 0-20 fms.

*Fossil.* Miocene: Vienna Basin. Pliocene: Coralline and Red Crag, S. France, Italy, Morea. Post-tertiary: Calabria, Rhodes.

On consideration I must include this genus in the *Venus* family, although its position is not quite satisfactory. It is in some respects allied to *Tapes*, and in others to *Saxicava*.

## 1. TAPES VIRGINEUS, Linné.

*Venus virginea*, L. S. N. p. 1136 (according to modern authors).

*Tapes virgineus*, B. C. ii. p. 352, pl. vi. f. 5; v. p. 185, pl. xxxix. f. 5.

'Porcupine' Exp. 1869: St. Donegal B., Lough Swilly, L. Foyle. Atl. Vigo B., C. Sagres, Tangier B.; Med. Capo de Gata (var. *sar-niense*), 55, 58.

*Distribution.* Finmark and Faroe Is. to E. Mediterranean and Adriatic; 0-180 fms.

*Fossil.* Miocene: Prussia, Vienna Basin, Transylvania, Switzerland, Turin, Calabria, Lisbon, Bordeaux Basin, Madeira (as *T. hoer-nesi*)? Upper Tertiaries and Post-tertiary: Scandinavia, British Isles, Italy, Greece, Rhodes; 0-50 ft.

I have collated no less than twenty-two synonyms. The very young are not unlike those of *Venus chione*.

## 2. TAPES GEOGRAPHICUS, Chemnitz.

*Venus geographica*, Chemn. Conch. Cab. vii. p. 45, t. 42. f. 440.

*Tapes pullastra*, B. C. ii. p. 355; v. p. 185, pl. xxxix. f. 6.

'Porcupine' Exp. 1869: St. Donegal B. 1870: Med. 50, 50 a.

*Distribution.* Finmark to Alexandria, Adriatic, Mogador, Cape of Good Hope, Japan; 0-45 fms.

*Fossil.* Upper Tertiaries and Post-tertiary: Scandinavia, British Isles, Mewe near Königsberg, Italy; 0-1360 ft.

More than a dozen synonyms, including *Venus pullastra* of Montagu. Since the publication of my last volume of 'British Conchology,' I have examined many hundred specimens of the southern form, *T. geographicus*, from the Mediterranean and Adriatic; and my former opinion (vol. ii. p. 359) of its being the same species as the northern form, *T. pullastra*, has been most fully and satisfactorily confirmed. There is not the slightest difference, except in size, between specimens from the north and south of Europe. But inasmuch as Chemnitz's name *geographicus* is far older than that of Montagu, I have no alternative but to substitute the former name for *pullastra*. It is possible that this species may be partly the *Venus literata* of Linné, who gave Europe as well as India as the habitat, and cited the 'Fauna Suecica' and Gualter's figure of *T. geographicus*.

3. *TAPES AUREUS*, Gmelin.*Venus aurea*, Gmel. S. N. (ed. xiii.) p. 3288.*Tapes aureus*, B. C. ii. p. 349; v. p. 185, pl. xxxix. f. 4.'Porcupine' Exp. 1869: St. Galway B., Donegal B. 1870: Atl. Gibraltar B. (var. *læta*, Poli, = *floridu*, Lamarck); Med. 50 (same variety).*Distribution*. Loffoden Isles to Ægean, Adriatic, Black Sea; 0-20 fms.*Fossil*. Upper Tertiaries and Post-tertiary: Scandinavia, British Isles, Belgium, Porto Maurizio cavern, Italy.

Numerous synonymys. A delicious and favourite shell-fish.

*LUCINOPSIS UNDATA*, Pennant.*Venus undata*, Penn. Brit. Zool. iv. p. 95, pl. 55. f. 51.*Lucinopsis undata*, B. C. ii. p. 363, pl. vii. f. 1; v. p. 186, pl. xl. f. 1.

'Porcupine' Exp. 1869: St. 18, 19. 1870: Atl. Vigo B., Setubal B., C. Sagres, Tangier B.

*Distribution*. Loffoden Is. to the Ægean, Adriatic, Mogador; 3-130 fms.*Fossil*. Upper Tertiaries and Post-tertiary: Scandinavia, British Isles, S.W. France?, Italy, Maine (*Lyell*)?; 0-130 ft.Syn. *Venus inquinata*, Lamarck, *Lucina gibbosula*, Basterot?, *Tellina caduca*, Scacchi, *Venus incompta*, Philippi, *Lucinopsis corrugata*, Brusina. It is difficult to distinguish this species from *Diplo-donta rotundata*, except by the hinge.

## Family XV. TELLINIDÆ.

1. *TELLINA BALAUSTINA*, Linné.*T. balaustina*, L. S. N. p. 1119: B. C. ii. p. 371; v. p. 186, pl. xl. f. 3.

'Porcupine' Exp. 1869: St. 6, 8, 14, 17, 23 a, 25, 68, Little Minch. 1870: Atl. 3, 6, 9, 16, 17 a, Setubal B., C. Sagres, 26, 29, 30, 36; Med. 45, Capo de Gata, Adventure Bank.

*Distribution*. Shetland to Guernsey, Bay of Biscay, throughout the Mediterranean and Adriatic, Sea of Marmora, Morocco, Madeira, Canaries; 2-130 fms.*Fossil*. Upper Tertiaries: Coralline Crag, Belgium, S. France, Italy. Post-tertiary: Calabria.*T. balaustina* is to a certain extent a local species; and I am surprised that it has not yet been noticed as Scandinavian, nor as occurring on the north-western coasts of France. The flower of the pomegranate or Carthaginian rose (from the colour of which the specific name of this *Tellina* is derived) was used by the ancient Rhodians in dyeing wool, and is a common emblem on their coins.2. *TELLINA CRASSA*, Pennant.*T. crassa*, Penn. Brit. Zool. iv. p. 87, t. xviii. f. 28: B. C. ii. p. 373; v. p. 186, pl. xl. f. 4.

'Porcupine' Exp. 1870: Atl. St. Vigo B., C. Sagres.

*Distribution.* Drontheim to Mediterranean, Senegal?, Japan; 0-55 fms.

*Fossil.* Miocene: Vienna Basin, Switzerland, S.W. France. Upper Tertiaries: British Isles, Belgium, Italy, Rhodes. Post-tertiary: Norway, England and Scotland, Calabria; 0-130 ft.

Several obsolete synonyms.

### 3. *TELLINA BALTHICA*, Linné.

*T. balthica*, L. S. N. p. 1120: B. C. ii. p. 375, pl. vii. f. 3; v. p. 186, pl. xl. f. 5.

'Porcupine' Exp. 1869: St. 9 (valve).

*Distribution.* Circumpolar, Novaya Zembla, Siberia, Finmark to Mogador, Mediterranean and Adriatic?, Black Sea, Labrador to Massachusetts, Behring Strait to N. Japan?, Madeira; 0-60 fms.

*Fossil.* Post-tertiary: Siberia, Scandinavia, British Isles, Germany, Italy, Canada; 0-1360 ft.

*T. solidula*, Pulteney, *Psammobia fusca*, Say, *T. grænlantica*, Beck, and other synonyms.

### 4. *TELLINA CALCAREA*, Chemnitz.

*T. calcarea*, Chem. Conch. Cab. vi. p. 140, t. 13. f. 136: B. C. ii. p. 389; v. p. 187.

'Porcupine' Exp. 1869: St. 65 (fragment), Loch Torridon. Both specimens are semifossil, and were apparently derived from glacial deposits.

*Distribution.* Arctic seas in both hemispheres, Scandinavia, N.E. and N.W. America southwards to Boston Bay and N. Japan; 0-128 fms.

*Fossil.* Upper Tertiaries: Iceland Crag, English Crag, Antwerp Crag, Italy. Post-tertiary: arctic regions, Siberia, Scandinavia, British Isles, and northern sea-beds, New Brunswick, Canada; 0-500 ft.

Synonyms. *T. lata*, Gmelin, *T. sabulosa*, Spengler, *Venus fragilis*, Fabricius, *T. ovata* and *T. obliqua*, J. Sowerby, *T. proxima*, Brown, *T. sordida*, Couthouy, *T. inconspicua*, Broderip and Sowerby, *T. prætenuis* (Leathes), Woodward, and *T. mæsta*, Deshayes. Some of these may be considered varieties; but all pass one into another.

### 5. *TELLINA SQUALIDA*, Pulteney.

*T. squalida*, Pult. in Hutch. Dors. p. 29: B. C. ii. p. 384; v. p. 186, pl. xli. f. 3, 3a.

'Porcupine' Exp. 1869: St. 9 (valve).

*Distribution.* Kullen in S. Sweden and W. Scotland to Jaffa, Adriatic, Morocco, Madeira, Canaries, and Azores; 0-49 fms.

*Fossil.* Upper Tertiaries: Italy, Madeira. Post-tertiary: Scotland and Ireland.

Synonyms. *T. depressa*, Gmelin, *T. incarnata*, Poli (not Linné), *T. daniliuna*, Brusina,

6. *TELLINA TENUIS*, Da Costa.

*T. tenuis*, Da Costa, Brit. Conch. p. 210 : B. C. ii. p. 379 ; v. p. 186, pl. xli. f. 1.

'Porcupine' Exp. 1870 : Atl. St. Vigo B., Med. 50.

*Distribution*. Finmark to the Morea, Adriatic, Mogador, Black Sea ; 0-40 fms.

*Fossil*. Upper Tertiaries : Italy. Post-tertiary : Scotland and Ireland.

*T. exigua*, Poli, and perhaps *T. incarnata* of Linné.

7. *TELLINA FABULA*, Gronovius.

*T. fabula*, Gron. Zooph. iii. p. 263, t. 18. f. 9 : B. C. ii. p. 382 ; v. p. 186, pl. xli. f. 2, 2a.

'Porcupine' Exp. 1869 : St. 9, Lough Swilly.

*Distribution*. Loffoden Is. and Faroe Is. to E. Mediterranean, Adriatic, Mogador, Cape of Good Hope ; 0-90 fms.

*Fossil*. Upper Tertiaries and Post-tertiary : Scandinavia, British Isles, S. France, Italy ; 0-130 ft.

8. *TELLINA COMPRESSA*, Brocchi.

*T. compressa*, Brocchi, Conch. foss. subapp. ii. p. 514, t. xii. f. 9.

'Porcupine' Exp. 1870 : Atl. St. Vigo B., 13, C. Sagres, 29, 30 ; Med. off Rinaldo's Chair (fragment).

*Distribution*. Bay of Biscay, different parts of the Mediterranean from Algiers to Palermo, Madeira ; 60-180 fms.

*Fossil*. Miocene : Austrian dominions, Switzerland, Italy. Upper Tertiaries : Coralline Crag, S. France, Sicily. Post-tertiary : Calabria.

Synonyms. *T. oudardii*, Payraudeau, *T. striatula*, Calcara, *T. strigata*, Philippi, *T. distorta*, Dubois (not Poli), *T. donacilla*, S. Wood, *Angulus macandræi*, G. B. Sowerby. The figures given by Payraudeau (pl. i. f. 16-18) do not show the external sculpture or the internal rib. Not *T. compressa* of Deshayes.

9. *TELLINA SERRATA* (Renieri), Brocchi.

*T. serrata* (Ren.), Broc. Conch. foss. subapp. ii. p. 510, t. xii. f. 1.

'Porcupine' Exp. 1870 : Atl. St. Vigo B., 13, Setubal B., C. Sagres, Tangier B. ; Med. Capo de Gata, 55, Benzert Road, Adventure Bank.

*Distribution*. Morbihan to the Archipelago and Sea of Marmora, Adriatic, Canaries ; 2-70 fms.

*Fossil*. Miocene : Vienna Basin, S.W. France, N. Italy, and Calabria. Upper Tertiaries : S. France, S. Italy, and Rhodes. Post-tertiary : Calabria.

10. *TELLINA PULCHELLA*, Lamarek.

*T. pulchella*, Lam. Anim. s. vert. v. p. 526 ; Poli, Test. utr. Sic. i. t. xv. f. 8 (as *T. rostrata*).

'Porcupine' Exp. 1870 : Med. St. Algesiras B., 50, Adventure Bank.

*Distribution.* Mediterranean and Adriatic; 10–20 fms.

*Fossil.* Upper Tertiaries and Post-tertiary: S. France, Italy.

*T. rostrata* of Born and Poli, but not of Linné.

# 11. TELLINA DISTORTA, Poli.

*T. distorta*, Poli, Test. utr. Sic. i. p. 39, t. xv. f. 11.

'Porcupine' Exp. 1870: Med. St. 55, G. Bona, Benzert Road, G. Tunis, Adventure Bank.

*Distribution.* Throughout the Mediterranean, Madeira and Canaries; 5–60 fms.

*Fossil.* Post-tertiary: Calabria.

I still believe this to be a variety of *T. donacina*; but in deference to other conchologists, I will retain it as a provisional species. The difference seems to consist in the smaller size and greater angularity of the posterior side. It may be as distinct as *T. pusilla*.

# 12. TELLINA DONACINA, Linné.

*T. donacina*, L. S. N. p. 1118: B. C. ii. p. 386; v. p. 187, pl. xli. f. 4.

'Porcupine' Exp. 1870: Atl. St. Vigo B., C. Sagres, Tangier B.

*Distribution.* Scotland to the Archipelago and Sea of Marmora, Black Sea, Adriatic, Madeira; 0–82 fms.

*Fossil.* Miocene: Austrian Empire, Switzerland, S.W. France. Upper Tertiaries and Post-tertiary: Coralline Crag and Scotland, Belgium, S. France, Italy, Algiers, Greece, Rhodes, Madeira.

# 13. TELLINA PUSILLA, Philippi.

*T. pusilla*, Phil. Moll. Sic. i. p. 29, t. iii. f. 9 a, b: B. C. ii. p. 388; v. p. 187, pl. xli. f. 5.

'Lightning' Exp.: St. 5.

'Porcupine' Exp. 1869: St. 13, The Minch, 52. 1870: Atl. Vigo B., C. Sagres, 30; Med. Algesiras B., 40, Adventure Bank.

*Distribution.* W. Finmark and Faroe I. to Mediterranean and Adriatic; 3–205 fms.

*Fossil.* Miocene: N.W. Germany (*Philippi*). Upper Tertiaries and Post-tertiary: Italy, Rhodes.

*T. pygmaea* (as of Philippi), Lovén.

# 14. TELLINA TENELLA<sup>1</sup>, Jeffreys. (Plate LXI. fig 11.)

SHELL trapezoid-shaped or irregularly oblong, much compressed, rather thin, semitransparent, and glossy: *sculpture*, irregular concentric impressed striæ, which become ridge-like towards the posterior side; the umbonal area is covered with close-set delicate striæ: *colour* pinkish, with longitudinal and broken rays of a deeper tint; there is no streak below the beak as in *T. donacina*; the whole surface is crossed lengthwise with very numerous fine whitish radiating lines, which are only observable with a lens and appear to permeate the structure of the shell: *epidermis* fibrous, yellowish brown,

<sup>1</sup> Somewhat delicate.

covering more especially the angle of the posterior side: *margins* somewhat rounded in front, with an oblique slope towards the posterior side, curved on the anterior side, and obliquely truncated with an angular and broadish area on the posterior side, where it slightly gapes at the end, dorsal margin gently sloping from the beak on each side, so as to form an obtuse angle: *beaks* small, slightly incurved, placed at a distance of about two fifths from the posterior end: *ligament* short, prominent, light horn-colour: *hinge-line* obtusely angular: *hinge-plate* rather thick and strong, interrupted or discontinued halfway on the posterior side: *teeth*, in the right valve two short but stout divergent cardinals, that on the posterior side being slightly cloven, besides a short lateral on each side; in the left valve there are also two cardinals, that on the anterior side being larger than the other and also slightly cloven; the tooth on the anterior side is slight and curved; this valve has no lateral tooth: *inside* highly polished and glossy, exhibiting the longitudinal rays and white lines: *pallial* and *muscular scars* conspicuous, the latter large. L. 0.3, B. 0.55.

'Porcupine' Exp. 1870: Atl. St. C. Sagres. Two perfect specimens and several valves.

This shell is thinner and more delicate than *T. donacina*; and it also differs from that species in the sculpture, colour, and broad posterior angle. It connects *Tellina* with *Psammobia*.

#### 1. PSAMMOBIA FERRÖENSIS, Chemnitz.

*Tellina ferröensis*, Chemn. Conch.-Cab. vi. p. 99, t. 10. f. 91.

*Psammobia ferröensis*, B. C. ii. p. 396; v. p. 187, pl. xlii. f. 3.

'Porcupine' Exp. 1869: St. 13, 18, 25, off Lerwick. 1870: Atl. C. Sagres, Tangier B.; Med. Algesiras B., Cartagena B., 50, 55, Benzert Road, Adventure Bank.

*Distribution*. Iceland and Finmark to Ægean and Sea of Marmora, Adriatic, Canaries; 0-90 fms.

*Fossil*. Miocene: S.W. France. Upper Tertiaries: Coralline Crag, Belgium, S. France, Italy, Cos, Rhodes. Post-tertiary: Norway, N. England and Ireland, Calabria; 0-600 ft.

For synonymy see 'British Conchology.'

#### 2. PSAMMOBIA COSTULATA, Turton.

*P. costulata*, Turt. Conch. Dith. p. 87, t. 6. f. 8: B. C. ii. p. 394; v. p. 187, pl. xlii. f. 2.

'Lightning' Exp. St. 2.

'Porcupine' Exp. 1869: St. 13. 1870: Atl. C. Sagres, Tangier B.

*Distribution*. Norway to the Archipelago, Adriatic, Mogador, Madeira, Canaries; 0-120 fms.

*Fossil*. Upper Tertiaries: Coralline Crag, Italy, Rhodes. Post-tertiary: Calabria.

A specimen dredged at Oban by Admiral Bedford is more than an inch wide.

## 3. PSAMMOBIA TELLINELLA, Lamarek.

*P. tellinella*, Lam. An. s. vert. v. p. 515: B. C. ii. p. 392, pl. vii. f. 4; v. p. 187, pl. xlii. f. 1.

'Porcupine' Exp. 1870: Atl. St. Vigo B.

*Distribution*. Loffoden Is. and Faroe Is. to Sicily; 0-85 fms.

*Fossil*. Upper Tertiaries: Coralline Crag, Madeira? Post-tertiary: Uddevalla.

## 4. PSAMMOBIA VESPERTINA, Chemnitz.

*Lux vespertina*, Chemn. Conch.-Cab. vi. p. 72, t. 7. f. 59, 60, a, b.

*Psammobia vespertina*, B. C. ii. p. 398; v. p. 187, pl. xlii. f. 4.

'Porcupine' Exp. 1869: St. 7 (fragment).

*Distribution*. Bergen to the Ægean, Adriatic, Mogador, Senegal?, Canaries; 0-40 fms.

*Fossil*. Upper Tertiaries: Coralline Crag, Italy. Post-tertiary: Belfast and Killiney, Calabria.

I am now inclined to think that Dillwyn may have been right in considering this species the *Tellina albida* of Linné. The hinge is certainly "absque dentibus marginalibus;" and the description agrees also as to colour, which is very variable. *P. intermedia* of Deshayes (Proc. Zool. Soc. 1854, p. 319), = *P. costata*, Hanley, apud McAndrew, is certainly a monstrous variety of *P. vespertina*, having stronger and more oblique concentric ridges. The types, from Algiers and Faro in Portugal, are now before me.

## 1. DONAX VITTATUS, Da Costa.

*Cuneus vittatus*, Da Costa, Brit. Conch. p. 202, pl. xiv. f. 3.

*Donax vittatus*, B. C. ii. p. 402, pl. vii. f. 5; v. p. 188, pl. xlii. f. 5.

'Porcupine' Exp. 1870: Atl. St. C. Sagres (valve).

*Distribution*. Norway to Egypt, Adriatic, Mogador; 0-25 fms.

*Fossil*. Upper Tertiaries and Post-tertiary: British Isles, S.W. France, Italy; 0-1360 ft.

For synonymy see B. C. ii. pp. 405, 406.

## 2. DONAX VENUSTUS, Poli.

*D. venusta*, Poli, Test. utr. Sic. ii. p. 80, t. 19. f. 23, 24.

'Porcupine' Exp. 1870: Med. St. Algesiras B., 40, 41, 50 51.

*Distribution*. Mediterranean from Gibraltar to the Ægean and Black Sea, Adriatic, Madeira; 0-8 fms.

*Fossil*. Upper Tertiaries: S. France, Italy. Post-tertiary: Calabria.

Differs from *D. vittatus* in being shorter or narrower, and in having the posterior side obliquely furrowed or striated.

## 3. DONAX TRUNCULUS, Linné.

*D. trunculus*, L. S. N. p. 1127 (partly): B. C. ii. p. 407; v. p. 188, pl. xlii. f. 6.

'Porcupine' Exp. 1870: Med. St. 51, Benzert Road (young).

*Distribution.* "Norv." (*Lovén*), Danish coasts (*Mus. Copenhagen*), S. Devon to Egypt, Black Sea, Adriatic, Mogador, Madeira, W. Africa?, Canaries; 0-45 fms.

*Fossil.* Upper Tertiaries: Red Crag, S.W. and S. France, Italy.

The right valve in this species invariably overlaps the other, so that the shell is strictly inequivalve. The young is triangular, and has prominent beaks; it is the *D. bellardii* of Canefri, and might easily be taken for a distinct species.

#### SUMMARY OF THE FOREGOING MOLLUSCA.

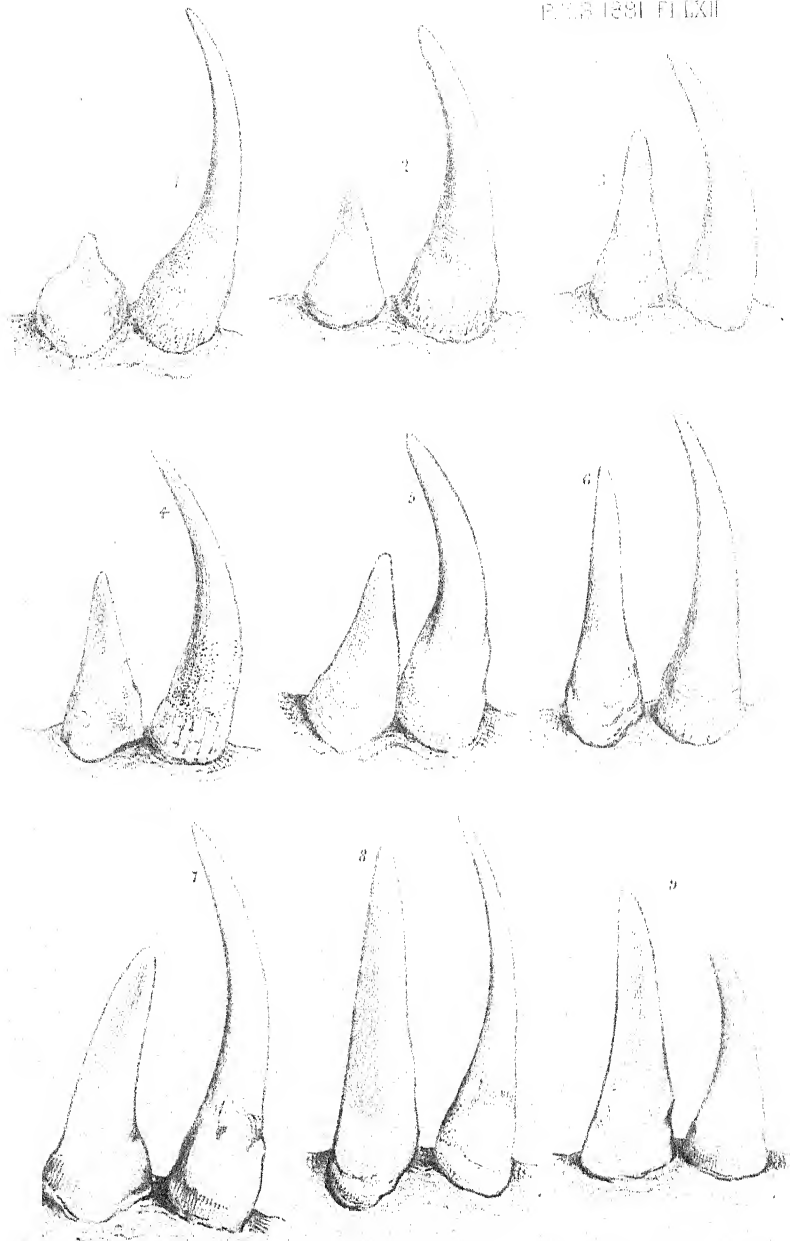
Families.	Genera.	No. of species.
VIII. KELLIIDÆ .....	PYTHINA, p. 693 .....	2
	LEPTON, p. 694 .....	4
	SCINTILLA, p. 695 .....	1
	SCACCHIA, 696 .....	1
	DECIPULA, p. 696 ....	1
	MONTACUTA, p. 696 ..	7
	LASÆA, p. 699 .....	2
	KELLIA, p. 700 .....	1
IX. LUCINIDÆ .....	LORIPES, p. 700 .....	3
	LUCINA, p. 701 .....	2
	AXINUS, p. 701 .....	9
	DIPLODONTA, p. 704 ..	2
X. CARDITIDÆ .....	CARDITA, p. 705 .....	3
XI. CARDIIDÆ .....	CARDIUM, p. 706 .....	12
XII. CHAMIDÆ .....	CHAMA, p. 709 .....	1
XIII. CYPRINIDÆ .....	ISOCARDIA, p. 710 ....	1
	CYPRINA, p. 710 .....	1
	ASTARTE, p. 711 .....	8
	CIRCE, p. 713 .....	1
XIV. VENERIDÆ .....	VENUS, p. 714 .....	10
	VENERUPIS, p. 716 ....	1
	TAPES, p. 717 .....	3
	LUCINOPSIS, p. 717 ....	1
XV. TELLINIDÆ .....	TELLINA, p. 718 .....	14
	PSAMMOBIA, p. 722 ....	4
	DONAX, p. 723 .....	3
	Total .....	98

#### EXPLANATION OF PLATE LXI.

- Fig. 1. *Scintilla rotunda*, p. 695.
2. *Scacchia tenera*, p. 696.
3. *Montacuta pellucida*, p. 697.
4. — *ovata*, p. 698.
5. *Axinus orbiculatus*, p. 702.
6. — *tortuosus*, p. 702.
7. — *incrassatus*, p. 703.
8. — *subovatus*, p. 704.
9. *Astarte acuticostata*, p. 711.
10. — *pusilla*, p. 713.
11. *Tellina tenella*, p. 721.







J. Smith del.

Hartshorn imp.

HORNS OF RHINOCEROS BICORNIS *1/10 Nat. Size.*

6. On the South-African Rhinoceroses. By F. C. SELOUS.  
(Communicated by Dr. A. GÜNTHER, F.R.S. &c.)

[Received May 21, 1881.]

(Plate LXII.)

In those portions of Southern and South Central Africa in which I have hunted I have only met with two true species of Rhinoceroses—namely the large, square-mouthed, grass-eating species (*Rhinoceros simus*), and the smaller prehensile-lipped Rhinoceros, which feeds exclusively upon bush (*R. bicornis*). In making this statement I am well aware that I express an opinion at variance with that held by many naturalists upon the subject; however, as the conclusions at which I have arrived are the results of eight years devoted entirely to hunting in the most out-of-the-way portions of the interior of South Africa, during the first three of which (that is, in 1872, 1873, and 1874) Rhinoceroses were still very plentiful, and as even since that time I have had many opportunities of personally observing the habits and peculiarities of each and every variety of these animals, and as, moreover, I shall support my views by specimens of horns, I think that I am warranted in expressing an opinion upon the subject. At any rate it is now quite time that the question of how many species of Rhinoceroses do really exist in South Africa should be finally set at rest; and it is only by comparing the statements of men who are really competent to give an opinion upon the subject that this is ever likely to be done.

For my part I am fully persuaded that there are only two species in South Africa, or, indeed, in all Africa; for the North-African Rhinoceros in the gardens of this Society I have no hesitation in pronouncing to be specifically identical with the South-African Prehensile-lipped Rhinoceros.

I will first speak of the Square-mouthed Rhinoceros (*R. simus*). Twenty years ago this animal seems to have been very plentiful in the western half of Southern Africa; now, unless it is still to be found between the Okavango and Cunene rivers, it must be almost extinct in that portion of the country. And this is not to be wondered at when one reads the accounts in Andersson's and Chapman's books of their shooting as many as eight of these animals in one night as they were drinking at a small water-hole; for it must be remembered that these isolated water-holes, at the end of the dry season, represented all the water to be found over an enormous extent of country, and that therefore all the Rhinoceroses that in happier times were distributed over many hundreds of square miles were in times of drought dependent upon perhaps a single pool for their supply of water. In 1877, during several months' hunting in the country to the south of Linyanti, on the river Chobe, I only saw the spoor of two Square-mouthed Rhinoceroses, though in 1874 I had found them fairly plentiful in the same district; whilst in 1879, during

eight months spent in hunting on and between the Botletlie, Mababe, Machabe, Sunta, and Upper Chobe rivers, I never even saw the spoor of one of these animals, and all the bushmen that I met with said they were finished. In 1878 and 1880, however, I still found them fairly numerous in a small tract of country in North-eastern Mashuna Land, between the Umniati and Ganyanc rivers. Their range, however, is rather limited towards the north, as they only inhabit the country lying to the south of the belt of rough stony hills which in this district extend for more than a hundred miles southwards from the banks of the Zambesi river. Their extermination in this portion of the country may therefore, I am afraid, be expected within a very few years; and the Square-mouthed Rhinoceros will then only exist in a few small tracts of S.E. Africa in the neighbourhood of the river Sabi.

The Square-mouthed Rhinoceros feeds exclusively upon grass, and is therefore more partial to open countries, or districts where there are broad grassy valleys between the tracts of bush, than the Prehensile-lipped Rhinoceros, which is fond of thickets or rough hills clothed with short scrub. Both species are a sort of dark slate-colour; and so far from one being white and the other black, I should be sorry to state upon oath which was the darker of the two.

The Square-mouthed Rhinoceros is a huge ungainly-looking beast, with a disproportionately large head, a large male standing 6 feet 6 inches at the shoulder. Like elephants and buffaloes they lie asleep during the heat of the day, and feed during the night and in the cool hours of early morning and evening. Their sight is very bad; but they are quick of hearing, and their scent is very keen; they are, too, often accompanied by rhinoceros-birds, which, by running about their heads, flapping their wings, and screeching at the same time, frequently give them notice of the approach of danger. When disturbed they go off at a swift trot, which soon leaves all pursuit from a man on foot far behind; but if chased by a horseman they break into a gallop, which they can keep up for some distance. However, although they run very swiftly, when their size and heavy build is considered, they are no match for an average good horse. They are, as a rule, very easy to shoot on horseback, as, if one gallops a little in front of and on one side of them, they will hold their course and come sailing past, offering a magnificent broadside shot; whilst under similar circumstances a Prehensile-lipped Rhinoceros will usually swerve away in such a manner as only to present his hind quarters for a shot. As with elephants, it is very unsatisfactory work following up wounded rhinoceroses, as they do not stop and lie down, but walk on and on until their strength gives way. They die very quickly when shot through both lungs or the upper part of the heart; but if the shot strikes them in front, and the bullet only perforates one lung, they will travel astonishing distances, though throwing blood out of their mouth and nostrils by the gallon. With a broken shoulder they will run, first at a gallop and then at a halting trot, for more than a mile; but if they have a hind leg broken, they do not appear to be able to budge a step. When either walking or running, the

Square-mouthed Rhinoceros holds its head very low, its nose nearly touching the ground. A small calf always runs in front of its mother; and she appears to guide it by holding the point of her horn upon the little animal's rump; and it is perfectly wonderful to note how in all sudden changes of pace, from a trot to a gallop or *vice versa*, the same position is always exactly maintained. During the autumn and winter months (*i. e.* from March till August) the Square-mouthed Rhinoceros is usually very fat; and its meat is then most excellent, being something like beef, but yet having a peculiar flavour of its own. The part in greatest favour amongst hunters is the hump, which, if cut off whole and roasted just as it is in the skin in a hole dug in the ground, would, I think, be difficult to match either for juiciness or flavour.

In the Square-mouthed Rhinoceros the horns vary much in different individuals—so much so, indeed, that it would not be difficult to find two specimens (taking both horns, of course) exhibiting forms of horns as widely divergent one from another as are the typical horns of *R. bicornis* from those of the so-called *R. keilloa*.

The anterior horn of a full-grown Square-mouthed Rhinoceros measures from 18 inches to over 4 feet in length, a cow having a thinner and usually a longer horn than a bull. Now-a-days, however, owing probably to all those that possessed remarkably long horns having been shot, it is very rarely one sees a horn from a freshly-killed animal measuring over 3 feet in length. This anterior horn usually has a curve backwards, more or less pronounced; but specimens are by no means uncommon which are perfectly straight, or even bend slightly forwards. When the horn is quite straight and about 3 feet in length, the point touches the ground as the animal walks along feeding; and thus, in specimens of long straight horns, it may usually be noticed that just at the point the anterior surface of the horn has been rubbed flat by friction against the ground. I never remember to have seen an anterior horn of a Square-mouthed Rhinoceros that was perfectly round: they always have the front surface partially flattened, and may thus at a glance be distinguished from the invariably rounded anterior horn of the Prehensile-lipped Rhinoceros. In different individuals, too, the posterior horn of the Square-mouthed Rhinoceros varies from a lump only 3 or 4 inches in height to a horn 2 feet in length. In some specimens the anterior horn is long, whilst the posterior is very short; in others, again, both are well developed; and in some, again, both are short. In fact, the horns of all South-African Rhinoceroses differ to such an extent in different individuals that if their classification is to be based upon the length and shape of their horns alone, it would be as easy to make twenty species as four. If *R. oswelli* (a variety of *R. sinus* based entirely upon the shape of the anterior horn) were a true species, I presume that the Square-mouthed Rhinoceros with a straight anterior horn would not interbreed with those carrying the commoner form of horn slightly curved backwards: yet in the Mashuna country I have seen Square-mouthed Rhinoceroses consorting together, the anterior horns of

which showed the greatest divergence of shape; and as a series of horns could be obtained showing every gradation of form between the extreme form of *R. oswelli* (which is bent forwards) to one so bent back as to describe half the arc of a circle, I do not think there are any adequate grounds for considering *R. oswelli* to be a true species. As regards the assertion that the horn of the ordinary Square-mouthed Rhinoceros never attains the length of those of *R. oswelli*, the longest horn I have ever seen was brought out by a trader named Reader, and is (or was a few years ago) in the possession of a gentleman residing in Hope Town, in the Cape colony. This horn measured 4 feet 6 inches, and had a very strong curve backwards. Upon these grounds I consider *R. oswelli* to be a false species, and think that in future works upon natural history it ought to be omitted from the list of South-African Rhinoceroses.

I now come to the Prehensile-lipped Rhinoceros (*R. bicornis*), of which I maintain that there is but one true species, in spite of whatever may be said by old Dutch hunters and natives to the contrary. This animal is still fairly numerous in many districts of South-eastern Africa, although, like its congener, the Square-mouthed Rhinoceros, it has been almost exterminated in the more westerly portions of the country. In 1879 there were still two or three drinking in the Upper Chobe, to the north-west of the Sunda outlet. Between the Chobe and the Zambesi there are none; and according to the natives there never were any there, even when the Makololo first came into the country; but directly the Zambesi has been crossed they are again found, and extend apparently through all Central Africa right up to Abyssinia. The Prehensile-lipped Rhinoceros lives exclusively upon bush and roots, eating not only the young leaves as they sprout from the end of a twig, but also chewing up a good deal of the twig itself. It is owing to the fact that this species lives upon bush that its range is very much more extended than that of the Square-mouthed Rhinoceros; for there are many large districts of country in the neighbourhood of the Zambesi to the eastward of the Victoria Falls covered almost entirely with an endless succession of rugged hills, almost devoid of grass, though well wooded, in all of which districts the Prehensile-lipped Rhinoceros is numerous, as it thrives well upon the scrubby bush with which the hill-sides and valleys are covered; whereas the square-mouthed species, though common in the forest-clad sandbelts and broad grassy valleys which always skirt the hills, is seldom or never found amongst the hills themselves, which is doubtless because the pasturage is too scanty to enable them to exist.

The Prehensile-lipped Rhinoceros is usually represented as an animal of so morose and vicious a disposition that it will almost invariably attack unprovoked any man or animal that it happens to meet; and I think that the general impression of people who are in the habit of reading books upon South-African sport, and have had no personal experience of the animals described, must be that this is the most dangerous animal to be met with in the country.

It may be that they differ in disposition in different parts of the country; but wherever I have met with them I have never found them to be by any means dangerous animals. Indeed I only remember to have seen one make any attempt at a charge; and that was in the Mashuna country last year, and under strong provocation; for I galloped close in front of an old cow, endeavouring to turn her from her course, upon which she came straight at me, snorting loudly, but upon my spurring to one side did not follow me, but resumed her way. Accidents have certainly happened in encounters with the Prehensile-lipped Rhinoceros; but many cases are also upon record of hunters having been killed or badly injured by the square-mouthed species, which is always represented as the most harmless and inoffensive of beasts. Mr. Oswell had his horse killed by one of the latter animals (*vide* Livingstone's 'Missionary Travels'); the veteran elephant-hunter Mr. Hartley was also very severely injured by one of these animals in the Mashuna country—I think, in 1869. David Jacobs, too, a son of the well-known Dutch hunter Petrus Jacobs, and who had been constantly hunting with his father for many years, told me that the only narrow escape he ever had from a Rhinoceros was from a square-mouthed one, which chased him for over a hundred yards through some nasty bush; and I myself, in November 1874, saw a white Rhinoceros bull, which I had wounded, make a very decided charge at a boy of mine, who threw down his gun and took refuge in a tree. I only mention these facts to show that, although the Square-mouthed Rhinoceros is usually a most inoffensive animal, occasional specimens may be found that are capable of resenting ill-treatment; and, so far as my small experience goes, I have found vicious animals to be equally few and far between amongst the prehensile-lipped species.

These Rhinoceroses are very quick and restless in their movements, and either very inquisitive or mistrustful of their eyesight; for usually, when disturbed by any one approaching from below the wind, they will jump up with a snort, gaze fixedly at the intruder, then, with another snort, trot quickly a few steps nearer, stand again, move their heads with a quick motion, first to one side, then to the other, advance again perhaps, and finally, when shouted at, whisk quickly round and trot away in grand style, with their tails screwed up over their backs. Whilst hunting in the Mashuna country in 1872, and to the west of the river Gwai in 1873, I encountered almost daily one or more Prehensile-lipped Rhinoceroses, often seeing five, six, or even eight in one day. When these animals got my wind, they invariably made off at once; but when they only saw me, they usually acted as I have described above. Upon these latter occasions my Kafirs were in the habit of shouting to me to run away, climb a tree, &c., and often did so themselves; however, I always stood where I was, throwing sometimes sticks, stones, or assegais at them, sometimes only shouting; and although some of them advanced from a distance of say forty yards to within about twenty, they always turned and ran off in the end. Upon several occasions I have fired into a Rhinoceros thus facing me, which, dropping upon its knees to the shot, has

sprung up again immediately, and come rushing straight forwards, snorting like a steam-engine, and passing perhaps within a few yards of me. In these cases, however, it always appeared to me that the animal had no idea of charging, but was just rushing madly forwards, half stunned by the shock of the heavy bullet. I have seen the same thing happen to some people, both black and white, who described it afterwards as the most terrific charge; and many a Black-Rhinoceros story has originated, I feel sure, in this way. That a Prehensile-lipped Rhinoceros when in full career, and either wounded or tired, will charge any one or any thing, even to a waggon or span of oxen, that he sees directly in his path and close in front of him, I know well enough; but so will an elephant, buffalo, or lion. What I wish to argue is, not that the Black Rhinoceros is a sweet-tempered animal, but that, at any rate in the great majority of cases, he is by no means the surly, morose, and dangerous beast that some travellers would have one believe. Somehow or other he has got an evil reputation, which, however unjust, will outlive the last of his species in South Africa. Kafirs who have never seen a Rhinoceros will tell you that it is a witch, and that it will follow up a man's spoor, attack him in the night, &c., simply because that is the character tradition has given him. Similarly many Hottentot and white hunters, who have only been hunting since Rhinoceroses became very scarce, and who perhaps have not seen half a dozen of these animals in their lives, will relate endless stories of their unprovoked ferocity; for it is one of their articles of faith that a Prehensile-lipped Rhinoceros is a most ferocious animal, and they therefore invent stories to suit his supposed character. Now there are very few Kafir or Hottentot hunters who will meddle with a lion, unless they meet him under exceptionally favourable circumstances; but, except when on elephant-spoor, or afraid of disturbing those animals, they will seldom pass a Rhinoceros, no matter of what species, without attacking him; for they know that they have to deal with an animal easy to approach and easy to kill, and one that will give them a great quantity of good meat; yet to hear them talk about the animals you would imagine the Rhinoceros to be the more dangerous of the two. What first gave rise to the very general impression that the Prehensile-lipped Rhinoceros is such a very dangerous animal I cannot imagine, unless, perhaps, in former years, before the introduction of firearms, there did exist some old and morose individuals of this species that committed a great many atrocities, and which have since been shot, leaving only their evil name to their descendants. However, be that as it may, speaking of the Prehensile-lipped Rhinoceros of the present day, after an experience of eight years, during which time I have encountered over one hundred of these animals, I can conscientiously say that I consider their pursuit to be attended with less danger than that of the lion, elephant, or buffalo.

In the end of November 1874, I chased a Prehensile-lipped Rhinoceros bull round and round on an open flat (at Thamma Setjie, on the Zambesi road), until he stood still with his mouth



open; and I then dismounted within twenty yards of him; yet he never attempted to charge. Now I doubt if there is a lion, an elephant, or a buffalo which, under similar circumstances, would not have charged. In my experience of hunting, many fatal accidents, and still more narrow escapes, from lions, elephants, and buffaloes have come within my personal knowledge, but not one hunter, black or white, has been injured by a Black Rhinoceros.

I will now give my reasons for asserting that *R. bicornis* and *R. keitloa* are not two distinct species; but merely varieties of the same animal. Perhaps the most convincing argument in favour of their being two distinct species is that all the old Dutch hunters and most of the natives declare that such is the case, and have different names for the two animals. This, however, is by no means so strong an argument as it would at first appear. At first sight the typical *R. keitloa*, with both horns of equal length, is a very different-looking animal from the typical *R. bicornis*, with a posterior horn of only a few inches length; and it is only after a careful study of their habits, and the knowledge that every variety of horn between the two extremes may be found, that I have become convinced that *R. keitloa* and *R. bicornis* are only varieties of the same animal. Now the greater part of the old Dutch hunters, although they may have shot very many Rhinoceroses in the course of their hunting careers, know nothing whatever about the animals from a scientific point of view. They shot Rhinoceroses because they wanted meat; but the only examination they ever made of them was to see if they were fat. When now and again they shot a Rhinoceros with both horns of equal length, or nearly equal length, it struck their eye as being unusual, and so they gave these equal-horned animals the name of Blue Rhinoceroses, to distinguish them from the White and the Black, as they call *R. sinus* and *R. bicornis* respectively. Now I have questioned many of these old hunters upon the subject, and find that the only point upon which they all agree is that the Blue Rhinoceros has both horns of equal length, whilst the Black has always a short second horn; beyond this none of them know of any definite distinction; but many, not liking to appear ignorant, make assertions that will not bear investigation, and one will often contradict the statements of other equally experienced men. Now in the same way every Dutch hunter will tell you that there are three, or even four, distinct species of lions in Southern Africa, each species possessing its own distinctive characteristics. These species they determine according to the length and colour of the mane in different individuals. Yet I think that naturalists are now agreed that there is but one species of lion in all Africa. Therefore as regards lions the testimony of old Dutch hunters is worthless from a scientific point of view; and I believe it to be equally worthless with regard to the plurality or unity of species of the Prehensile-lipped Rhinoceros. One famous old Dutch hunter even affirms that there are three species of Square-mouthed Rhinoceros, and four of the Prehensile-lipped, seven in all; and he bases his distinctions almost

entirely on the shape and length of the horns in different individuals.

Now I have carefully examined and measured many specimens of Prehensile-lipped Rhinoceroses, and have never been able to discover that they differed in any way the one from the other, except in the length and shape of the posterior horn; nor could I ever discover the differences between the two mentioned by Mr. C. J. Andersson and other writers upon the subject. Some specimens had long curly hair upon their ears; but some of the most marked forms of *R. bicornis* had this peculiarity equally strongly marked as others whose horns showed them to belong to the so-called species *R. keitloa*. Many writers upon the subject state that whereas *R. bicornis* eats nothing but bush, *R. keitloa* eats both grass and bush indiscriminately. Now, if this were the case, how is it that during eight years, more than three fourths of which I have spent in the wilderness, engaged in a continual search for elephants, and always in countries where Rhinoceroses may still be found in greater or lesser numbers, I have only observed two kinds of dung—the black dung, composed entirely of grass, evacuated by the large Square-mouthed grass-eating Rhinoceros, and the dark red dung (with a greenish tinge when the animal has been feeding upon sprouting shoots), full of little chips of wood, evacuated by the prehensile-lipped species. It appears to me that, if there were a species which fed indiscriminately upon grass and bushes, one would see a third kind of dung, in which sometimes bush and sometimes grass would predominate; but this is most certainly not the case. Again, every Kafir and Masara in the interior will tell you that there are three kinds of Rhinoceroses, namely:—*R. sinus*, which the Matabele call “Umhofo” and the Bechuanas “Chukuru;” *R. bicornis*, which the former call “Upeygan” and the latter “Borele;” and, lastly, *R. keitloa*, which they name respectively “Shangainea” and “Keitloa.” But when they are questioned beside a dead Rhinoceros, I have found that they all base their distinction between *R. bicornis* and *R. keitloa* upon the length of the posterior horn alone. Some, indeed, will say that the two varieties differ in size or in the length of hair upon the ears. But I have proved, by actual measurement and personal observation, that the variations in size and the length of the hair upon the ears have nothing to do with the length of the posterior horn, which is the fundamental point upon which all Dutch and native hunters base the distinction between the two species. Again, when one comes upon a Rhinoceros-spoor in the bush, any bushman or Kafir hunter can say whether it is the spoor of a Square-mouthed Rhinoceros or of a Prehensile-lipped one, simply judging from the size of the footprint. But no Kafir or bushman can tell you, when he sees the smaller spoor of a Prehensile-lipped Rhinoceros, whether it be that of *R. bicornis* or *R. keitloa*, nor even when he sees the dung can he tell you; for, as I have said before, there is no difference in this particular. However, when the animal has been shot they will say to which species it belongs. If the second horn is not over seven or eight inches in length, they will be all

agreed that the animal is *R. bicornis* (Upeygan or Borele); if the second horn is from twelve inches to two feet long, they will be unanimous that it is *R. keitloa* (Shangainea or Keitloa); whereas if the posterior horn be neither short nor long, but just betwixt and between, they will argue for hours amongst themselves as to whether the animal be *R. bicornis* or *R. keitloa*; but their main argument is always based upon the length of the horn.

Every one who has wandered over country frequented by Rhinoceroses must have noticed that the square-mouthed species leaves its dung alone, not throwing it about with its horn, nor ploughing up the ground every now and again as it walks along; whereas the Prehensile-lipped Rhinoceroses almost invariably throw their dung all over the place, sometimes ploughing up holes a foot deep with their noses and horns; and they are, too, continually making semi-circular furrows in the ground as they walk along. This is done by every Prehensile-lipped Rhinoceros, irrespective of the length of the posterior horn; therefore, if there are two species, it must be conceded that their habits are exactly similar in this respect. Again, the Square-mouthed Rhinoceros (*R. simus*) walks and runs with its nose close to the ground, whilst all Prehensile-lipped Rhinoceroses walk and run with their heads carried high in the air. A calf of the square-mouthed species always runs when small in front of its mother, whereas the small calves of all Prehensile-lipped Rhinoceroses always follow their mothers. Therefore whilst there are many and wide differences of form and habit between the Square-mouthed and all Prehensile-lipped Rhinoceroses, the habits of both species of the latter (if there be two species) are exactly similar.

In conclusion, I have only to bring to your notice the series of horns which is now upon the table, and ask those gentlemen who believe that there are two distinct species of Prehensile-lipped Rhinoceroses in Southern Africa to point out where *R. bicornis* ceases and *R. keitloa* commences.

*List of Horns exhibited, and figured on Plate LXII.*

(1) Black Rhinoceros, ♂. Shot by J. S. Jameson and myself, near the Umniati river, North-eastern Mashuna land, August 1880. (Plate LXII. fig. 1.)

(2) Black Rhinoceros, ♂. Shot by myself at Thamma Setjie, on the Zambesi road, November 1874. (Plate LXII. fig. 2.)

(3) Black Rhinoceros, ♀. Shot by J. S. Jameson on the lower Umfule, North-eastern Mashuna land, August 1880. (Plate LXII. fig. 3.)

(4) Black Rhinoceros, ♀. Shot by myself near the junction of the Gwai and Shangani rivers, Matabele country, September 1873. (Plate LXII. fig. 4.)

(5) Black Rhinoceros, ♂. Shot by J. S. Jameson near the river Umsengairi, North-eastern Mashuna land, September 1880. (Plate LXII. fig. 5.)

(6) Black Rhinoceros, ♀. Shot by H. C. Collison near the

river Umsengaisi, North-eastern Mashuna land, September 1880. (Plate LXII. fig. 6.)

(7) Black Rhinoceros, ♂. Shot by myself on the bank of the river Chobe, August 1874. (Plate LXII. fig. 7.)

(8) Black Rhinoceros, ♀. Shot by one of my hunters between the Umfulé and Umzweswe rivers, North-eastern Mashuna land, August 1880. (Plate LXII. fig. 8.)

(9.) Black Rhinoceros, ♀. Shot by one of my hunters between the Umfulé and Umzweswe rivers, North-eastern Mashuna land, September 1880. (Plate LXII. fig. 9.)

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June 21, 1881.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May 1881 :—

The total number of registered additions to the Society's Menagerie during the month of May was 130, of which 25 were by birth, 53 by presentation, 35 by purchase, 13 were received on deposit, and 4 by exchange. The total number of departures during the same period, by death and removals, was 124.

The most noticeable additions during the month of May were as follows :—

An African Wild Ass (*Equus tæniopus*) from Upper Nubia, purchased May 26th, being the second example of this form of Wild Ass which we have received.

A White-marked Duck (*Anas specularis*) from Antarctic America, purchased May 26th, being the first specimen of this fine species which has been obtained for the Collection.

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Mr. R. Bowdler Sharpe, F.Z.S., exhibited a specimen of *Podilymbus podiceps* of North America, stated to have been killed at Radipole near Weymouth in January 1881, and belonging to the collection of Mr. R. W. Monro.

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Dr. A. Günther exhibited a specimen of a Mediterranean fish (*Schedophilus medusophagus*) which had been captured in August 1878 at Portrush in Ireland, and read a description of it.

This description, together with a figure coloured from a drawing of the fish taken in a fresh state, will be published in the Society's 'Transactions.'

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The following papers were read :—

1. On the Petrel called *Thalassidroma nereis* by Gould, and its Affinities. By W. A. FORBES, B.A., F.L.S., F.G.S., Prosecutor to the Zoological Society.

[Received May 17, 1881.]

In this Society's Proceedings for the year 1840, the late Mr. Gould described a "beautiful fairy-like" new species of Stormy Petrel from Bass's Straits, which he called *Thalassidroma nereis* (tom. cit. p. 178), under which name it is figured in the last volume of the 'Birds of Australia.'

Dr. Elliott Coues, in his revision of the family Procellariidæ<sup>1</sup>, treating of the species under the name *Procellaria nereis*, says:—"I have had the pleasure of examining Mr. Gould's types of this species from Bass's Straits, Australia, now in the collection of the Philadelphia Academy. It is a beautiful little species, quite unlike any other known Stormy Petrel. In form it comes nearer to *Procellaria pelagica* than to any other species; and it is *probably congeneric with it, though it differs somewhat*<sup>2</sup> in the proportion of the tarsus and toes, and very widely in its pattern of coloration.\* \* \* The proportions of the tibia and tarsus differ from those of *pelagica* in the greater comparative length of the former."

Amongst the Petrels mentioned at various times by the late Prof. Garrod as having been examined by him, a species several times occurs which is doubtfully named "*Procellaria* (or *Thalassidroma*) *fregata*?"<sup>3</sup> The specimens dissected by him are now before me, and have been identified by Mr. Salvin as being really referable to the *Procellaria nereis* of Gould, an example of which, from the Falkland Islands, is now in the museum of Messrs. Salvin and Godman. A careful examination of the three spirit-specimens of this bird, as well as of the skin mentioned, have convinced me that this species is not referable to the true genus *Procellaria* as represented by *Procellaria pelagica*, and is in fact in no way related to that group of Petrels, but has its nearest allies in the flat-clawed genera *Oceanites*, *Fregatta*, and *Pelagodroma*.

In his paper on the muscles of the thigh in Birds<sup>4</sup> the late Prof. Garrod divided the Nasutæ, or Petrels, into two groups, the "Storm-Petrels" and the Fulmaridæ, the former group differing from the latter in that they possess the accessory semitendinosus muscle (Y), but lack intestinal cæca. In the Fulmaridæ, on the other hand, the accessory semitendinosus muscle is absent, but cæca are present. The species of Storm-Petrels on which this generalization was based are called, with doubt<sup>5</sup>, "*Procellaria pelagica* and *P. fregata*," the latter being the species now identified by Mr. Salvin

<sup>1</sup> Proceedings of the Academy of Natural Sciences of Philadelphia, 1864, p. 81.

<sup>2</sup> The italics are mine.—W. A. F.

<sup>3</sup> Cf. P. Z. S. 1873, pp. 470 and 641.

<sup>4</sup> P. Z. S. 1874, p. 122.

<sup>5</sup> P. Z. S. 1873, p. 641.

as *P. nereis*. As regards the first-named species, there can be little or no doubt that the bird really dissected by Prof. Garrod, and called by him "*Procellaria pelagica*," was Wilson's Petrel (*Oceanites oceanicus*), as in this bird there are no cæca<sup>1</sup>, at the same time that the accessory semitendinosus muscle is present. The true *Procellaria pelagica* (of which I have lately dissected two perfectly fresh examples) agrees with the Fulmaridæ, as defined by Prof. Garrod, in having cæca<sup>2</sup>, but no accessory head to the semitendinosus; and *Cymochorea leucorrhoa* agrees in both these points with *Procellaria pelagica*.

The so-called "*Procellaria nereis*" of Gould is therefore obviously not a true *Procellaria* at all; and this view is confirmed by other characters, such as the shape of its nostrils, the elongated tarsi, which are much longer than the mid toe<sup>3</sup> and covered anteriorly with transversely arranged scutellæ<sup>4</sup>, the very minute hallux, and the lamellar, concave form of the claws. It belongs, in fact, to the group of *Oceanites*, *Fregetta*, and *Pelagodroma*, but is not exactly congeneric with any of them. I propose therefore to make it the type of a new genus, to be called *Garrodia*, in memory of my lamented friend A. H. Garrod, not only as a token of my personal esteem for, and indebtedness to him, but also as some slight recognition of the thanks ornithologists generally owe him for the additions he made to our knowledge of the anatomy of birds.

The genus *Garrodia* may be shortly defined as follows:—

**GARRODIA.** Genus ex ordine Tubinarium OCEANITÆ maxime affine, tarsis pro digitis longioribus et antice scutellatis, necnon margine sterni posteriore integro distinguendum.

Type *Procellaria nereis*, Gould.

*Garrodia* is perhaps most closely allied to *Oceanites*, as already stated, but differs from that genus in having the tarso-metatarsi covered anteriorly with a series of transverse scutellæ instead of being "entire," in their slightly greater proportional length as compared with the third toe<sup>5</sup>, in the even more minute hallux, and in the more flattened and lamellar form of the claws. The sternum too is posteriorly entire, whereas in *Oceanites oceanicus* it is slightly notched. The coloration of the two genera is also quite different. From *Fregetta* *Garrodia* may be easily distinguished by the very different proportions and forms of the nails and feet in that genus, and from *Pelagodroma* by its much shorter feet and entire tail.

These four genera—*Oceanites*, *Garrodia*, *Pelagodroma*, and

<sup>1</sup> Cf. also Macgillivray, in Audubon's 'Ornithological Biography,' v. p. 646.

<sup>2</sup> Cf. Macgillivray, l. c. p. 313; also Wagner in Naumann's 'Vögel Deutschlands,' x. p. 556.

<sup>3</sup> In *Procellaria pelagica* and *Cymochorea leucorrhoa* the tarso-metatarsus is not longer, and may be shorter, than the 3rd toe. As against 21·5 and 21·5, and 23 and 26 millim. in the two first-mentioned genera, in the so-called *Procellaria nereis* the lengths of the two are respectively 34 and 26 millims.

<sup>4</sup> In *Procellaria pelagica* the tarsi are pretty uniformly covered with somewhat irregular hexagonal scutes.

<sup>5</sup> In a specimen of *Oceanites oceanicus* (in spirit) the middle toe measures 29 millim.; in one of *Garrodia* the length is 26 millim. The length of the metatarsus in both is 34 millim.

*Fregetta*—form a very well-marked family of the Tubinares, which may be called Oceanitidæ, as distinguished from the remainder of the group, or Fulmaridæ of Prof. Garrod. Anatomically, these four genera agree together, and differ from the Fulmaridæ (on nearly all the genera of which, including *Diomedea* and *Puffinuria*, I have notes), in the two important characters already mentioned—the absence of cæca and the presence of the accessory semitendinosus muscle. Externally they may be at once recognized by their peculiar elongated tarsi, lamellar nails, and by never having more than 10 secondaries, *Procellaria* and *Puffinuria* having 13, and the remaining Fulmaridæ more (in *Diomedea*, according to Nitzsch, as many as 40). My family Oceanitidæ, in fact, corresponds to Bonaparte's section “\*\* *Unguibus depressis*” of his Procellariæ<sup>1</sup>, and to Coues's “second group” of the similarly-named section in his ‘Review’<sup>2</sup> with the addition, in each case, of *Garrodia*, included by both authors in the restricted genus *Procellaria*.

Being now engaged in a report, for the Voyage of H.M.S. ‘Challenger,’ on the anatomy of the Petrels collected during that expedition, I propose to reserve further details of the differences and characters of these two groups, and of the genera composing them, till that occasion.

## 2. Observations on the Habits of the *Echidna hystrix* of Australia. By GEORGE J. BENNETT, C.M.Z.S.

[Received May 17, 1881.]

Having been now engaged for nearly three years in endeavouring to get an Echidna with the young *in utero*, that it might assist me in ascertaining whether they are oviparous or ovoviparous, I have had the opportunity of observing the habits of this interesting little animal in its native haunts. I hope therefore that a few notes collected during that time may be of interest.

Most of my observations have been made at Rosewood, a station below the Range, and the property of Messrs. Kent and Wienholt, from whose manager, Mr. Edmund Lord, I have received much valuable assistance. Their “black boy” Johnny has always been at my disposal. Without him I could have got very few specimens, as he is most sagacious in tracking these animals.

My first trip with Johnny showed many of the difficulties in my way. We saw a great many tracks, but no animals. The ground was rooted up as if so many pigs had been there tearing up the ground, which the Echidnæ do with their noses, to uncover the insects lying under the dead leaves. They then go to the fallen rotten trees, quite denuding them of bark, and tearing out the rotten wood and feasting on the insects, which, on examination, I found to be small

<sup>1</sup> Conspr. Av. ii. p. 197 (1857).

<sup>2</sup> *Op. cit.* p. 74, where characters for it are given.

beetles, ants, and a white juicy worm. Many small dead saplings had been knocked down by the Echidnas in their search at the roots for their food. They are particularly partial to the white ants, which erect small mounds of clay about 18 inches in height. These they attack in a most systematic way, by working round the nest, by clearing away the earth and forming a trench where the nest joins the earth, and devouring all before them; and then they make a hole in the centre and clear out the whole nest, leaving none behind to tell the tale of their visit. The soldier-ant (a large stinging ant) they do not touch; their nests were close to the white-ant mounds, but were untouched.

The larger sugar-ants, which raise mounds of sand about 16 inches high and 4 feet in diameter, they attack first, by lying on the mound with their tongue out and drawing in the ants that cross it; there they remain sometimes for hours. This, I have no doubt, is the time that they get the sand found in their stomach. They then make a hole from one side to the other, and devour the most delicate morsels coming in their way. In the daytime they do not move about much, beginning their search about a couple of hours before sundown. They are very quick of hearing; so that one's movements have to be very cautious and slow, as the least crackle of a leaf anywhere near makes them draw in their snouts and begin at once to burrow their way into the ground, which they do by means of their legs, moving the whole of the body into the burrow and spreading the earth over their backs. The speed with which they do this is almost incredible, very little disturbance of the earth being observable after the animal has disappeared. They do not, as a rule, burrow straight ahead; in only one instance have I known this to happen; this was the case of an Echidna put into a box, which went down into the ground under the box and got away, coming out under a paling fence at a distance of 10 feet.

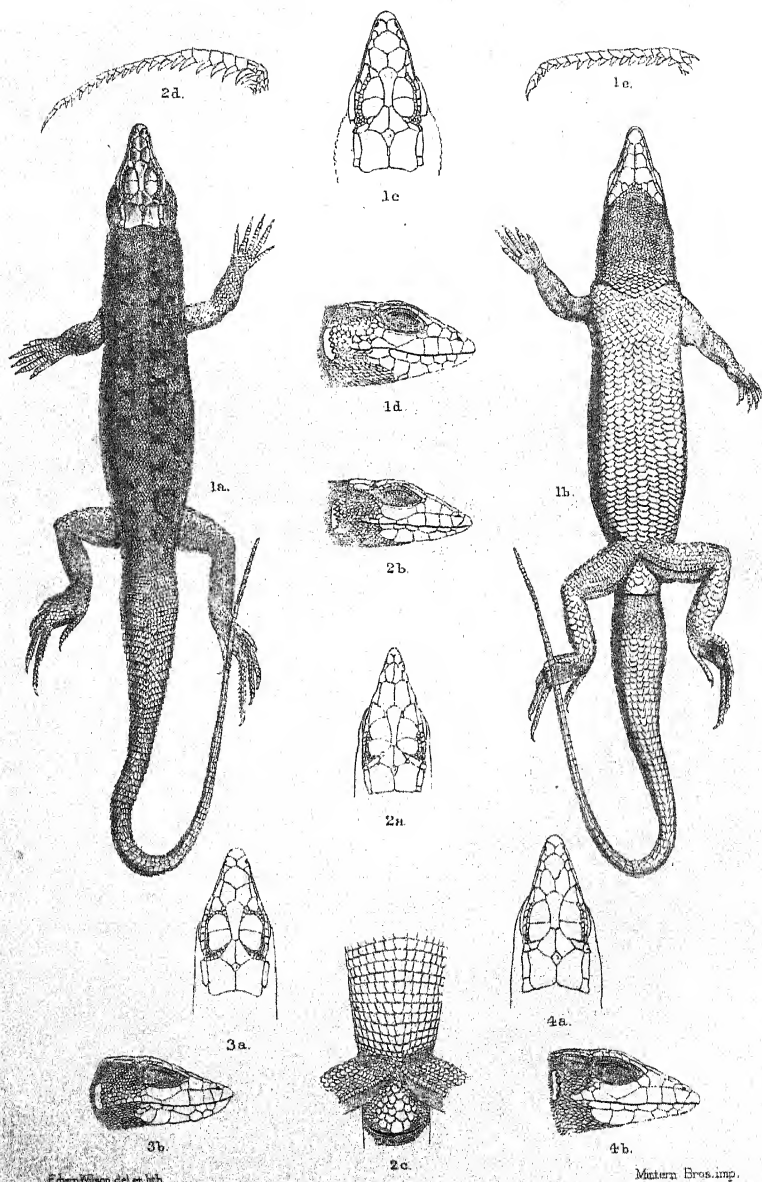
Their muscular strength is enormous; as I remarked before, they can fell saplings with a good-sized sound root. I have known them force out wire netting, well fastened with large broad tacks; any thing they can once get a purchase against must go before them, if they are attempting to escape; large stones 30 lb. in weight they move clean out of the way; so that, when they are got, if the dissecting-knife is not used at once the difficulty is to keep them.

There is a prevalent idea that Echidnas lie dormant during the winter; but this is not the case, as I began my observations first in June 1878, which is the Australian midwinter, and I found that they were as keen in their search after food then as at any other part of the year. To arrive at their breeding-season has been my greatest difficulty: I do not think it can be fixed at any certain period, but must in some places begin earlier than in others.

In July I got a male specimen which had the testes very much enlarged, fully the size of a hen's egg, being  $1\frac{1}{2}$  inch in length and  $2\frac{1}{4}$  inches in diameter. I continued to collect specimens to August 9th, and transmitted them, through my father, Dr. George Bennett, F.Z.S., to Professor Owen, who decided that none were actually





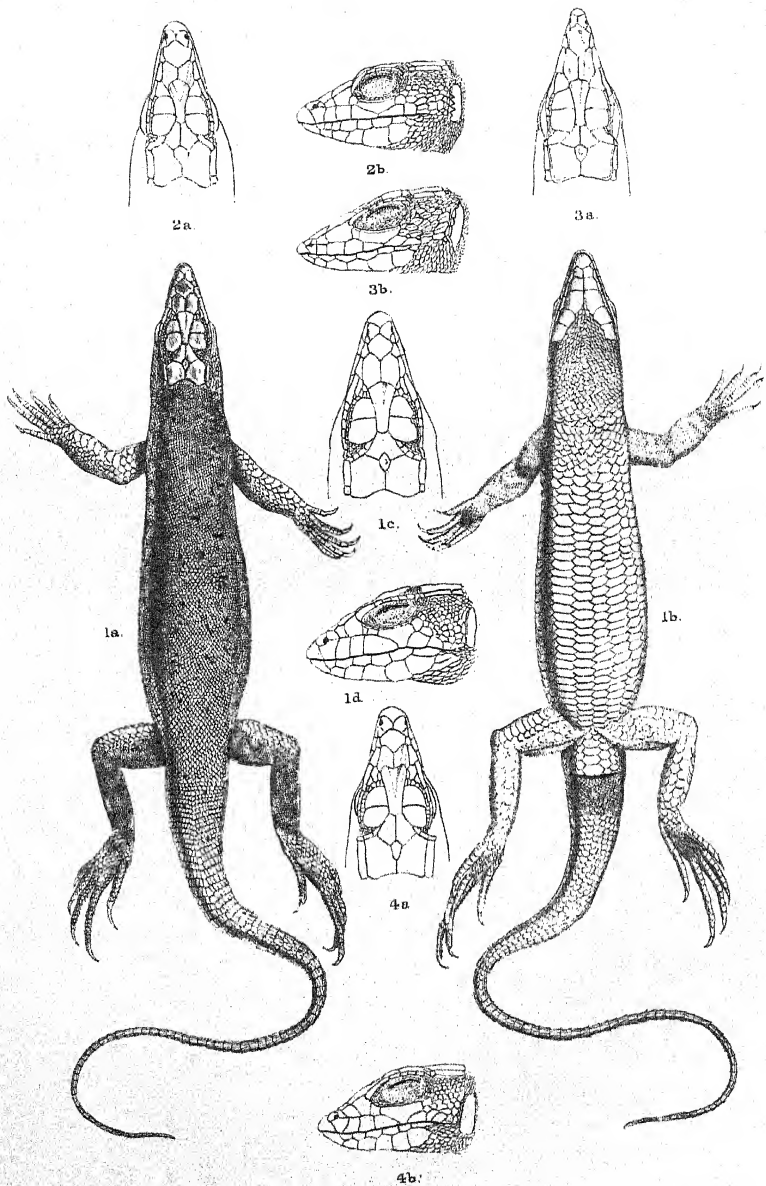


Edm. Meunier del. et lith.

Mutern Bros. imp.

1. ACANTHODACTYLUS BEDRIAGAE. 2. A. SCUTELLATUS.  
3. A. MICROPHOLIS. 4. A. SYRIACUS





Edmon. Wilson del. et lith.

Minteri Bros. imp.

1. ACANTHODACTYLUS TRISTRAMI. 2. A. BOSKIANUS.  
3. A. CANTORI. 4. A. VULGARIS

impregnated, but that a specimen got on the date above mentioned was in preparation to receive the semen.

I recommenced my labours the following year on August 12, and completed them on September 29. These specimens I also forwarded, through my father, to Professor Owen, who found two examples impregnated, one killed on the 30th of August and the other on the 14th of September, a report of which cases he read before the Royal Society in April 1880. Unfortunately, a specimen got on September 15th, which I delayed dissecting until next day, produced a young one during the night, but in the morning was in too decomposed a state to preserve.

It is therefore evident that in this part of Queensland the proper time to get an impregnated specimen of the *Echidna* with the young in the uterus is in September and October. I was under the impression, through my earlier observations, that the males do not go with the females after the copulating season; but this is not the case; I am sure, however, that after impregnation the females go away by themselves, and do not mix with the males until after the young is born.

I am of opinion that neither the young males or females have any sexual intercourse until their second year, as I have many young males with their testes in a dormant state and young females with the ovaries unexcited. Also, from observation, I am led to believe that the females only breed every second year, as many of my older specimens were not impregnated nor in any way prepared to receive the semen.

### 3. On the Lizards of the Genera *Lacerta* and *Acanthodactylus*. By G. A. BOULENGER.

[Received May 31, 1881.]

(Plates LXIII., LXIV.)

Thirty-five years have elapsed since Gray's 'Catalogue of Lizards' was published; and a great number of the species therein described still remain objects of difficulty to herpetologists. This is due chiefly to the shortness and ambiguity of Gray's diagnoses, which do not allow of the identification of his species, nor give an exact idea of their affinities.

With regard to the family Lacertidæ, no one has as yet attempted to make out the species enumerated in the 'Catalogue of Lizards.' Whilst engaged in naming some *Lacertæ* and *Acanthodactyli*, I recognized the necessity of going through all the species of these two genera; and I have the pleasure of laying before the Zoological Society the result of this work. Beside the species contained in Gray's Catalogue, I have also taken notice of those described since by Dr. Günther. This paper, therefore, is a critical account of all the species of *Lacerta* and *Acanthodactylus* represented in the British Museum.

I. Genus *LACERTA*, Linn.

As already observed by different authors, this genus has been divided in a most unnatural manner by Gray. It will not be necessary to discuss the characters of these so-called genera, the number of which amounts to five, viz. *Zootoca*, Wagl., *Lacerta*, L., *Thetia*, Gray, *Teira*, Gray, and *Nucras*, Gray. All these I consider to belong to one genus. *Notopholis*, Fitz., which by some is united with *Lacerta*, may, I think, be kept apart, and ought perhaps to be united with *Algira*, Cuv., as the recently discovered *Zerzoumia blanci*, Lataste<sup>1</sup>, is a link connecting the two forms.

*ZOOTOCA OXYCEPHALA* (Schleg.), Gray, Cat. p. 29.

The young specimen referred with doubt to this species proves to be *Lacerta muralis*. I have never seen an example of *L. oxycephala*; but Bedriaga, in his important paper<sup>2</sup>, shows that it is doubtless perfectly distinct from *L. muralis*.

*ZOOTOCA TAURICA* (Pall.), Gray, Cat. p. 29.

The British Museum did not possess this Lizard when the Catalogue was published. This species is now represented in the collection (3 ♀s, Crimea). It bears great resemblance to *L. vivipara*. The scutellation of the temple is the same in both. The collar is decidedly toothed. The dorsal scales are granular, and perfectly smooth; three transverse series correspond to a ventral plate. The ventral plates are in six longitudinal series. The anal plate is surrounded by two series of small plates. Femoral pores 18. The free edge of the caudal scales is shortly pointed, the shape being thus intermediate between that of *L. vivipara* and that of *L. muralis*, var. *fusca*.

*ZOOTOCA DERBIANA*, Gray, Cat. p. 29.

This species is identical with *Lacerta galloti*, D. & B., as had been recognized by my late friend Arthur O'Shaughnessy. This identification proves that the locality given with doubt "Australia? Sydney?" is, as might have been expected, the result of misinformation. It is perhaps hardly necessary to observe that the diagnosis given by Gray is, as usual, quite unreliable. First he states that there are 12 rows of ventral shields in *Z. derbiana*, 12 or 14 in *Z. galloti*; the fact is, that in this respect the forms do not differ from each other, the number of longitudinal series of plates being 12 or 14. Then the "minute granules between the dorsal scales," mentioned in *Z. derbiana* and not in *Z. galloti*, occur in both, and seem to be a specific character, which, however, can be ascertained only in specimens which have the skin somewhat distended. Finally it is stated that the middle series of ventral plates are the largest; it is the reverse.

<sup>1</sup> 'Le Naturaliste,' 1880, p. 299.<sup>2</sup> Arch. f. Naturg. 1880, p. 250, pl. xi.

ZOOTOCA DESERTI, Günther, P. Z. S. 1859, p. 470.

As has been supposed by Lataste<sup>1</sup>, this species belongs to the genus *Acanthodactylus*.

ZOOTOCA TRISTRAMI, Günther, P. Z. S. 1864, p. 491,  
is likewise an *Acanthodactylus*.

ZOOTOCA DANFORDI, Günther, P. Z. S. 1876, p. 818.

Doubts having been expressed by Bedriaga<sup>2</sup> as to the distinctness of *Podarcis judaica*, Camerano (= *Lacerta laevis*, Gray), from *Z. danfordi*, I think it useful to give a detailed description of the fine specimens in the British Museum. From this it will appear that the species are, without doubt, perfectly distinct from each other.

Shape and general proportions as in *L. muralis*, var. *neopolitana*, but the neck a little thicker, as broad as the head (in the adult *L. laevis* the neck is broader than the head). Postnasals 2, regularly superposed; upper labials 7 or 8, 5 before, and 2 or 3 behind the infraocular; 6 or 7 lower labials; 5 pairs of chin-shields, the 3 anterior in contact. The woodcut accompanying Günther's description represents the mental divided into two; this is a mistake, as not one out of the nine specimens shows any thing of the kind. Boettger<sup>3</sup> is therefore wrong when, judging from this drawing, he assigns 6 chin-shields to *L. danfordi*, and mentions this amongst the characters differentiating this Lizard from *L. judaica*. Temple covered with small granular scales, either without or with a very small masseteric plate (in *L. laevis* this plate is always present, and very large); a curved tympanic plate, similar to that of *L. muralis* and *L. laevis*. Occipital plate not broader than interparietal (broader than interparietal in *L. laevis*). The collar has its free edge even, and is formed of 9 or 10 plates. Dorsal scales round, granular, perfectly smooth, even on the hinder part of the back (hexagonal and distinctly keeled on the hinder part of the back in *L. laevis*); three transverse series correspond to a ventral plate. 23 to 27 pectoral plates. Six longitudinal and 24 to 27 transverse rows of ventral plates, the two central longitudinal rows narrower than the others; sometimes an additional series of smaller plates on each side (22 to 25 transverse rows in *L. laevis*). Anal plate small, much smaller than in *L. laevis*, surrounded by two rows of small plates. Femoral pores, 21-25 in ♂, 19-21 in ♀ (the specimens of *L. laevis* in the British Museum possess 20-21 in ♂, 16-17 in ♀). An important sexual character, which I have not met with in any other *Lacerta*, is the great dilatation, in the males, of two scales at the base of the tail at a short distance from the vent, similar to the sexual scales of many Iguanidæ. Scutellation of the tail as in *L. muralis* and *L. laevis*.

The coloration (in spirits) is also different from that of *L. muralis*, var. *fusca* and *L. laevis*, to both of which it bears, however, at first sight, great resemblance. Upper surface greenish brown. Head

<sup>1</sup> 'Le Naturaliste,' 1881, p. 358.

<sup>2</sup> Arch. f. Naturg. 1879, p. 312.

<sup>3</sup> Ber. Senckenb. Ges. 1879-1880, p. 172.

spotted with black; a few black spots on the back; sides and limbs closely spotted with black. Females and young with more or less defined light spots, surrounded by a dark network. Lower surface greenish; throat more or less spotted with black; males with one or two black dots on each ventral shield, as in *L. stirpium*; these dots generally entirely absent in females. The spots on the lower surface and on the head are never met with in *L. laevis*.

Dimensions.	♂	♀ <sup>1</sup>
	metre.	metre.
Total length .....	0·227	0·147
Length of head .....	0·019	0·013
Breadth of head .....	0·012	0·0085
Length of neck .....	0·011	0·009
Length of trunk .....	0·048	0·040
Length of fore limb .....	0·027	0·022
Length of hind limb .....	0·041	0·035
Length of tail .....	0·149	0·085

LACERTA LÆVIS, Gray, Ann. N.H. i. (1838), p. 229, and Cat. p. 31; Günth. P. Z. S. 1864, p. 488.

This Lizard has been considered equivalent to *L. agilis* (*L. stirpium*) by Bedriaga and Boettger; the reason which induced them to take this view, I do not know. The type specimen is a female, bleached; in proportions and pholidosis it agrees perfectly with the recently described *Podarcis judaica*, Camerano<sup>2</sup>. The specimens from Palestine referred to by Günther are in good state, and the coloration agrees with that of *L. judaica* as described by Camerano, Bedriaga<sup>3</sup>, and Boettger<sup>4</sup>. Consequently the name *judaica*, Camer. (1877), must be altered to that of *laevis*, Gray (1838).

LACERTA STRIGATA, Eichw., Gray, Cat. p. 32.

*L. viridis*, L., Günth. P. Z. S. 1864, p. 488.

The British Museum possesses fine specimens of this form, which, in general appearance seems quite different from *L. viridis*. However, no important structural difference being noticeable, I think *L. strigata* must be considered merely a variety of *L. viridis*.

At present, 17 species of *Lacerta* appear to be perfectly characterized. In the following synopsis, I have endeavoured to facilitate their determination. I have used as a character the number of upper labials in front of the infraocular; but it must be observed that there may be accidentally one labial more or less. These irregularities occur very rarely, and generally only on one side; and as, in this difficult group, several specimens are, as a rule, required to name a lizard properly, I think this character will be of great help in distinguishing the species.

<sup>1</sup> Tail injured.

<sup>2</sup> Atti Ac. Sc. Torino, xiii. 1877, p. 92, pl. ii. figs. 2 & 5.

<sup>3</sup> Arch. f. Naturg. 1880, p. 270.

<sup>4</sup> Ber. Senckenb. Ges. 1879-1880, p. 172.



*Synopsis of the Species of the genus Lacerta.*

## I. A single large plate on the anal region.

## 1. Lower eyelid opaque.

## A. Collar distinctly toothed.

## a. Four anterior upper labials; a single postnasal.

Dorsal scales hexagonal elongate, rather large, two series corresponding to a ventral plate .....

1. *vivipara*, Jacq.

Dorsal scales granular, small, three series corresponding to a ventral plate .....

2. *taurica*, Pall.

## b. Four anterior upper labials; two postnasals.

Postnasals not regularly superposed .....

3. *stirpium*, Daud.

Postnasals regularly superposed; occipital moderate; dorsal scales hexagonal elongate, keeled .....

4. *viridis*, L.

Postnasals regularly superposed; occipital large; dorsal scales oval, keeled .....

5. *schreiberi*, Bedr.

Postnasals regularly superposed; occipital large; dorsal scales granular .....

6. *ocellata*, Daud.

## B. Collar even.

## a. Five anterior upper labials; two postnasals.

Dorsal scales perfectly smooth; masseteric disk none; a single row of small plates surrounding the anal .....

7. *punctata*, Gray.

Dorsal scales perfectly smooth; masseteric disk very small; 8-10 longitudinal rows of ventral plates .....

8. *brandti*, De Fil.

Dorsal scales perfectly smooth; masseteric disk none or very small; 6-8 longitudinal rows of ventral plates .....

9. *danfordi*, Gthr.

Dorsal scales keeled; masseteric disk large .....

10. *lævis*, Gray.

## b. Four anterior upper labials; a single postnasal .....

11. *muralis*, Laur.

## c. Five anterior upper labials; a single postnasal.

Ventral plates in 6 longitudinal series ...

12. *oxycephala*, Fitz.

Ventral plates in 12-14 longitudinal series

13. *galloiti*, D. & B.

## 2. Lower eyelid transparent .....

14. *perspicillata*, D. & B.

## II. Two or more large plates on the anal region; occipital very small.

Two postnasals; 8 longitudinal series of ventral plates .....

15. *delalandii*, M.-Edw.

Two postnasals; 6 longitudinal series of ventral plates .....

16. *tessellata*, Smith.

A single postnasal; 6 longitudinal series of ventral plates .....

17. *taniolata*, Smith.

Out of these 17 species, 3 are unrepresented in the British Museum, viz. *L. schreiberi*, *L. oxycephala*, and *L. brandti*.

## II. Genus ACANTHODACTYLUS, Fitz.

ACANTHODACTYLUS BELLII, Gray, Cat. p. 36.

As has been supposed by Strauch, Schreiber, and myself, this form is the young of *A. vulgaris*.

*ACANTHODACTYLUS CAPENSIS*, Smith, Ill. Zool. S. Afr. pl. 39; Gray, Cat. p. 37.

Two specimens, presented by Sir A. Smith, are in the British Museum. From these, I see that it is not an *Acanthodactylus*, but a *Scapteira*, as has been suspected by Dr. Peters<sup>1</sup>. I am also convinced that *Podarces* (*Scapteira*) *cuneirostris*, Strauch<sup>2</sup>, is not specifically distinct from *A. capensis*.

*ACANTHODACTYLUS SAVIGNYI* (Aud.), Gray, Cat. p. 37.

This species is not the *Lacerta savignyi*, of Audouin, which I have not yet succeeded in identifying, but the same as that described as *Zootoca deserti* by Günther, and as *Acanthodactylus bedriagai* by Lataste. The name *deserti*, Gthr., though prior to that of *bedriagai*, must be cancelled, as there is a *Lacerta deserti*, Milne-Edwards, which is also an *Acanthodactylus*.

*ACANTHODACTYLUS INORNATUS*, Gray, Cat. p. 38.

Is identical with *A. scutellatus*.

I am acquainted with ten species of *Acanthodactylus*. Their synonymy and principal characters are as follows:—

1. *ACANTHODACTYLUS SCUTELLATUS*. (Plate LXIII. fig. 2.)

*Lacerta scutellata*, Aud. Descr. Egypte, Rept. (Suppl.) i. p. 172, pl. i. f. 7; M.-Edw. Ann. Sc. N. xvi. pp. 74 & 85, pl. vi. f. 3.

? *Lacerta olivieri*, Aud. l. c. p. 174, pl. i. fig. 11.

*Lacerta dumerilii*, M.-Edw. l. c. pp. 76 & 85, pl. vii. f. 9!

*Scapteira inornata*, Gray, Ann. Nat. Hist. i. p. 280.

*Acanthodactylus scutellatus*, Dum. and Bibr. Erp. Gén. v. p. 272; Gray, Cat. Liz. p. 37; Strauch, Mém. Ac. Sc. St. Pétersb. (7) iv. no. 7, p. 30; Bouleng. Bull. Soc. Zool. France, 1878, p. 185.

*Photophilus scutellatus*, Fitz. Syst. Rept. i. p. 20.

*Acanthodactylus inornatus*, Gray, Cat. Liz. p. 38.

Snout acutely pointed. Three palpebral shields. Infraocular not reaching the lip. Front edge of the ear strongly toothed<sup>3</sup>. Scales granular, smooth on the front part of the back, rhomboidal, keeled on the remaining part. Ventral plates not broader than long, in 14–16 longitudinal series. Præanal plates subequal. Digital denticulations very long.

*Hab.* North Africa; Senegal (Paris Mus.); Syria (British Mus.; Brussels Mus.).

2. *ACANTHODACTYLUS BOSKIANUS*. (Plate LXIV. fig. 2.)

*Lacerta boskianus*, Daud. Rept. iii. p. 188, pl. xxxvi. f. 2; Aud. loc. cit. p. 174, pl. i. f. 10.

*Lacerta aspera*, Aud. loc. cit. pl. i. f. 9.

*Acanthodactylus boskianus* (Fitz.), Wiegman. Herp. Mex. i. p. 10;

<sup>1</sup> Monatsb. Berl. Ac. 1869, p. 61.

<sup>2</sup> Bull. Ac. St. Pétersb. xii. (1867) p. 318.

<sup>3</sup> This character, however, in this and other species, is subject to a certain amount of variation, and must be used with caution.

Dum. & Bibr. loc. cit. p. 278; Gray, Cat. Liz. p. 38; Strauch, loc. cit. p. 38; Bouleng. loc. cit. p. 182.

Three or four palpebral shields. Infraocular not reaching the lip. Front edge of the ear strongly toothed. Dorsal scales very much larger on the hinder part of the back, imbricate, strongly keeled. Ventral plates broader than long, in 10-12 longitudinal rows. Digital denticulations very long.

*Hab.* N. Africa; Abyssinia, Arabia (British Mus.); Syria (British Mus.; Brussels Mus.).

### 3. ACANTHODACTYLUS CANTORI. (Plate LXIV. fig. 3).

*Acanthodactylus cantori*, Günth. Rept. Brit. Ind. p. 23; Stoliczka, Journ. As. Soc. 1872, pt. 2, p. 91; Blanf. E. Persia, Zool. p. 381.

This species resembles very much *A. boskianus*. The shape of the head is different, the snout being here longer and acutely pointed; the fronto-nasal and præfrontal shields are consequently more elongate. As a rule, there is a greater number of longitudinal rows of ventral plates, viz. 12-14. The front edge of the ear is never strongly toothed.

*Hab.* N.W. Hindostan; Baluchistan; Persia.

### 4. ACANTHODACTYLUS MICROPHOLIS. (Plate LXIII. fig. 3.)

*Acanthodactylus micropholis*, Blanf. loc. cit. p. 283, pl. xxvi. f. 2.

Three or four palpebral shields, the front one frequently separated from the following by a row of granules. Infraocular generally forming part of the lip. Front edge of the ear slightly toothed. Dorsal scales granular on the neck and between the shoulders, larger, semioval, and sharply keeled on the rest of the back. Ventral shields broader than long, in 10-12 longitudinal rows. Digital denticulations not very long.

*Hab.* Baluchistan.

### 5. ACANTHODACTYLUS SYRIACUS. (Plate LXIII. fig. 4.)

*Acanthodactylus boskiana*, var. *syriacus*, Boettger, Ber. Senck. Ges. 1878-79, p. 69.

*Acanthodactylus savignyi*, part., Boettger, Jahresb. Senck. Ges. 1879-80, p. 178 (specimens from Syria).

Four palpebral shields. Infraocular not reaching the lip. Temporal scales imbricate, keeled. Front edge of the ear slightly toothed. Dorsal scales slightly keeled on the neck and between the shoulders, larger, semioval and acutely keeled on the rest of the back. Ventral plates broader than long, in 10-12 longitudinal rows. Digital denticulations not very long.

This species is very closely allied to *A. micropholis*, from which it may be distinguished by the larger, imbricate, and keeled scales of the temporal region, and the more acute keel of the dorsal scales.

*A. syriacus* is known to me from the description of Boettger, and from one specimen collected in Palestine by Dr. Anderson.

*Hab.* Syria.

6. *ACANTHODACTYLUS SCHREIBERI*.

*Acanthodactylus velox*, Bonap. Faun. Ital. pl. f. 3.

*Acanthodactylus savignyi*, Schreib. Herp. Eur. p. 387.

*Acanthodactylus savignyi*, var. *schreiberi*, Bouleng. Bull. Soc. Zool. France, 1878, p. 188.

*Acanthodactylus savignyi*, sp., Boettg. loc. cit. (specimens from Cyprus).

Four palpebral shields. Infraocular not reaching the lip. Temporal scales granular. Front edge of the ear slightly toothed. Dorsal scales granular on the neck and between the shoulders, rhomboidal and bluntly keeled on the rest of the back. Ventral plates broader than long, in 8-10 longitudinal rows. Digital denticulations not very long.

I have nothing to add to the description I have given three years ago of this form, which I erroneously considered a variety of *A. savignyi*, a species which is only known from the figure in the 'Description de l'Egypte.'

*Hab.* I have stated that the specimens described by me came from the *Crimea*. Dr. Strauch believes this to be very unlikely. Dr. Boettger's specimens are from Cyprus.

7. *ACANTHODACTYLUS BEDRIAGÆ*. (Plate LXIII. fig. 1.)

*Acanthodactylus savignyi*, Dum. and Bibr. loc. cit. p. 273 (part.); Gray, Cat. Liz. p. 37; Strauch, loc. cit. p. 36.

*Zootoca deserti*, Günth. P. Z. S. 1859, p. 470, and 1864, p. 488.

*Lacerta deserti*, Strauch, loc. cit. p. 32.

*Acanthodactylus bedriagai*, Lataste, Le Naturaliste, 1881.

Three palpebral shields, the anterior frequently divided into two or three small shields. Infraocular not reaching the lip. Front edge of the ear slightly toothed. Dorsal scales granular, rhomboidal, and swollen or slightly keeled on the hind part of the back. Ventral plates broader than long, in 12-14 longitudinal rows. Digital denticulations not very long.

Of this species I possess numerous specimens from Egypt and Algiers, kindly given to me by M. Lataste. I have seen many other specimens in the Jardin des Plantes and in the British Museum. I was at first inclined to consider it a variety of *vulgaris*; but I now fully agree with M. Lataste that it is perfectly distinct.

*Hab.* N. Africa; Syria (British Museum).

8. *ACANTHODACTYLUS TRISTRAMI*. (Plate LXIV. fig. 1.)

*Zootoca tristrami*, Günth. P. Z. S. 1864, p. 491.

*Acanthodactylus inornatus*, Peters, Mon. Berl. Ak. 1869, p. 62.

Two palpebral shields, bordered in front with two or three small ones. Infraocular forming part of the lip. Front edge of the ear not toothed. Dorsal scales rhomboidal, flat, larger on the middle of the back, perfectly smooth. Scales at the base of the tail also perfectly smooth. Ventral plates broader than long, in 8-10 longitudinal rows. Digital denticulations not very long.

The type specimen from the Lebanon is a ♀, in a bad state. I have seen besides four specimens, collected in Palestine by Dr. Anderson.

9. *ACANTHODACTYLUS VULGARIS*. (Plate LXIV. fig. 4.)

*Lacerta velox* (non Pallas), M.-Edw. loc. cit. pp. 78 & 85, pl. 6. f. 7, and pl. 7. f. 4; Dugès, Ann. Sc. N. xvi. p. 383, pl. 15. f. 6.

*Acanthodactylus vulgaris*, Dum. & Bibr. loc. cit. p. 268; Strauch, loc. cit. p. 35; Schreiber, Herp. Eur. p. 390; Bouleng. loc. cit. p. 195; Bedriaga, Arch. Naturg. 1879.

*Acanthodactylus boschianus* (non Daud.), Bonap. Faun. Ital. pl. f. 2.

*Otenodactylus vulgaris*, Fitz. Syst. Rept. i. p. 20.

*Acanthodactylus velox*, Gray, Cat. Liz. p. 36.

*Acanthodactylus bellii*, Gray, loc. cit.

Two palpebral shields. Infraocular generally forming part of the lip. Front edge of the ear not toothed. Dorsal scales small, smooth, sometimes slightly keeled on the hind part of the back. Ventral plates broader than long, in 10 longitudinal rows. Digital denticulations not very long.

*Hab.* S. France; Spain and Portugal; Algiers.

10. *ACANTHODACTYLUS LINEO-MACULATUS*.

*Acanthodactylus lineo-maculatus*, Dum. & Bibr. loc. cit. p. 276; Gray, Cat. Liz. p. 37; Strauch, loc. cit. p. 37; Boettg. Abh. Senck. Ges. 1874, p. 9; Schreiber, loc. cit. p. 385; Bouleng. loc. cit. p. 191.

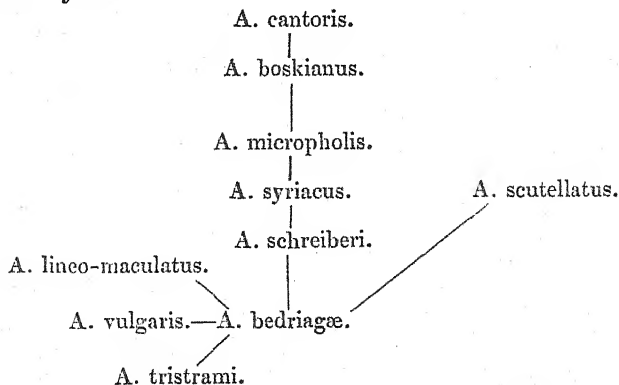
*Chorodromus lineo-maculatus*, Fitz. loc. cit.

Two palpebral shields. Infraocular, as a rule, not reaching the lip. Front edge of the ear very slightly toothed. Dorsal scales small, rhomboidal, distinctly keeled. Ventral plates broader than long, in 10 longitudinal series. Digital denticulations not very long.

*Hab.* Morocco; Algiers.

Two species are desiderata in the British Museum—*A. syriacus* and *A. schreiberi*.

The following scheme exhibits the affinities of the species of *Acanthodactylus*:—



4. Field-notes on the Antelopes of Central South Africa, made during eight years spent in many different districts of the country. By F. C. SELOUS.

[Received June 17, 1881.]

(Plate LXV.)

The observations which I now offer to the Society have been made during the different hunting-expeditions which I enumerate below : they are entirely the results of my own personal experience of the animals themselves, and are not derived from information supplied by native or Dutch hunters.

In October 1871 I left the Diamond Fields, and, travelling through Griqualand, struck the Orange River at Keis, and following its northern bank reached Uisip, on the borders of Namaqualand, in the January following, getting back to the Diamond Fields in March. In April 1872 I again left the Diamond Fields, and travelling along the eastern border of the Kalahari desert, through Kuruman, Secheli's town, and Bamangwato, reached the Matabele country, 300 miles to the north-east of the latter place, in the following August. A few days later I started for the Mashuna country, and reached the river Umnyati in September. Here I remained hunting Elephants (principally in the "fly"-infested country to the north-east) until the end of the year. From January to June 1873 I was constantly travelling about the outskirts of the Matabele country, trading and shooting. In the beginning of June, I travelled to the country near the junction of the Gwai and Shangani rivers, and remained hunting Elephants in that district and throughout the mountainous country between the Gwai and the Victoria Falls until the following November, at the end of which month I returned to the Matabele country. From then until the following March I remained in the Matabele country, making a journey across the open downs to the south-east of Inyati and reaching the junction of the Ingezi and Lunti rivers. In the beginning of May 1874 I left the Tati gold-mine, and travelled with my waggon to Daka, about 60 miles south of the Victoria Falls. In the beginning of June I went on foot to the Falls, and then followed the course of the Zambesi and Chobe rivers to the neighbourhood of Linyanti, where I remained hunting for several months, returning to the waggon in October. I then made another hunting-trip amongst the hills to the east of the Victoria Falls. In the beginning of November (the waggon having started for the Matabele country) I travelled to the junction of the Gwai and Zambesi rivers, and from there cut right across country to the waggon-road, finding the waggon at Thammasetjie. In the end of December I again reached the Matabele country. In February 1875 I travelled down country to Natal and returned to England.

In March 1876 I again landed at the Cape, and after a five months' journey, travelling by bullock-waggon through the Cape

colony, Orange Free State, and Transvaal, and thence along the Marico and Limpopo rivers to Bamangwato, at last reached Tati, on the south-western frontier of the Matabele country, in August. Here I remained hunting on several tributaries of the Limpopo until the following December, when I trekked down to the Diamond Fields, returning to Tati again in April 1877. I then started at once for the Zambesi, reaching Daka in May. From that date until the end of October I was hunting on the Chobe in the neighbourhood of the Sunta outlet, and in the country between the Chobe and Mababe rivers. In Nov. 1877, after sending my waggons to the Matabele country, I crossed the Zambesi on foot at "Wankies" town, and, following its northern bank, reached the mouth of the Kafukwe in December. From here I struck to the north-west through the mountains beneath which the Kafukwe runs, and, travelling over the Manica plateau, reached "Sitanda's" town, situated near the swampy Lukanga river, in January 1878. In February I again reached the mouth of the Kafukwe river, and in the following month, crossing the Zambesi a little to the west of the mouth of the Sanyati (a tributary from the south), struck due south across country, and reached the Matabele country once more in May 1878. Here I was detained doing nothing through ill-health until August, when I made a hunting-trip to the north-eastern part of the Mashuna country in the neighbourhood of the Ganyane river, returning to the Matabele country in the end of December. I then went down to the Transvaal, and getting back to Bamangwato in April 1879, started on a hunting-expedition to the upper Chobe. Travelling through the desert to the Botletlie river, I followed its eastern bank for some distance and then struck across to the Mababe river, which I reached early in June. From this time until December I hunted on the Machabe, Sunta, and Chobe rivers, and then travelling through the great salt-pans into which the Botletlie runs, reached Bamangwato again in January 1880. I then went down to the Transvaal and Diamond Fields, and in the end of May got back to the Matabele country again, and at once started on my last hunting-expedition to North-eastern Mashuna land, where I remained hunting until the end of the year. On leaving Mashuna land I travelled down country, and, skirting the western border of the Transvaal, reached the Diamond Fields in February 1881.

After this slight sketch of my routes, I proceed to give my notes upon the various Antelopes which I met with during these expeditions.

#### 1. OREAS CANNA.

(*Eland* of the Dutch and English; *Pofo* of the Bechuanas; *Impofo* of the Amandebele; *Ee-pofo* of the Makalakas; *Mofa* of the Mashunas; *Insefo* of the Masubias and Batongas; *Oo-schefo* of the Macubas; *Doo* of the Masaras.)

The Eland is now extinct in the Cape Colony, Natal, the Orange Free State, Griqualand West, and the Transvaal, and almost so in all the countries watered by the tributaries of the Limpopo, to the west of the Matabele country. In the Kalahari desert to the west of

Secheli's and Bamangwato it is plentiful, but never now comes as far eastwards as the waggon-road between those two places. North of Bamangwato, along the roads leading to the Lake Ngami and to the Victoria Falls of the Zambesi, there are always a few Elands to be found, though they are usually very scarce; at times, however, large herds wander out of the Kalahari desert, as far eastwards as the waggon-road leading from Bamangwato to the Zambesi. These migrations usually happen in the months of February and March; and the Bushmen say that they are to be accounted for by the fact that at that time of year a particular sort of small bush is in leaf, of which Elands are very fond. In all the country between the Botletlie and Chobe rivers, Elands are still to be found in greater or lesser numbers, and I have often seen herds of over a hundred together. In the dry desert country through which the Chobe runs they are particularly plentiful. Again, if we take the country further eastwards, Elands are still to be found in considerable numbers to the north-east, east, and south-east of the district inhabited by the Amandebele, and in many parts with which I am acquainted are very plentiful. In the broken mountainous country extending all along the Zambesi eastwards, from the Victoria Falls to beyond the river Gwai, I never saw any Elands or their spoor; but in the sandy country immediately to the south they are fairly plentiful. Between the Chobe and Zambesi rivers I found Eland plentiful; and so far as I went to the north of the Zambesi I also found them.

The skins of Elands that I have seen from the Kalahari desert have no signs of a stripe upon them, and the dark mark above the knee on the inside of the fore leg is either very faint or altogether wanting. In April 1879 I shot several Eland cows about 60 miles north of Bamangwato, on the road to Lake Ngami. I looked at all of them very carefully, but could not detect the faintest sign of a stripe, though some of them had the patches on the inside of the fore legs of a light grey colour. During the following months I shot many Elands on the eastern bank of the Botletlie river, on the Matabele, and on both sides of the Chobe river. Every one of these Elands was more or less striped, some so faintly as to be barely perceptible, some very plainly. In the Mashuna country again, to the north-east of the Matabele country, every Eland cow is very plainly striped, many of them having the stripes quite as plain as they are on a Koodoo, and the patches on the inside of the fore legs of a deep black. The one Eland (a cow) which I shot to the north of the Zambesi was beautifully marked, having nine broad white stripes on each side, and a broad black line down the centre of the back. Elands that are much striped often have a whitish mark across the nose, in the same place as in the Koodoo.

Old Eland bulls have very little hair on their skins, and look a dark slaty blue colour, owing to the colour of the skin showing through the scanty hair; and on these old animals, naturally enough, no sign of stripes can be perceived. Old cows also turn to a slate-colour from the same cause. In every large herd of Elands, cows are to be seen of every shade of colour from pale fawn to bluish grey.



Therefore your old hunter, who knows of four species of Lions, and six or seven Rhinoceroses, says that there are two or three distinct species of Elands, the blue, the yellow, and the striped. An Eland bull that I shot last year in the Mashuna country, measured 5 ft. 9 in. at the wither. This measurement was carefully taken with a tape line, between two assegais fixed in the ground parallel to one another, the one at the fore foot, the other at the wither. This was an ordinary bull; and I feel sure that they attain a greater size in the more desert country further west; at least that is my impression, judging by the eye. The longest pair of Eland bull-horns I have seen measured 2 ft. 6 in. in length, the longest pair of cow-horns 2 ft. 10 in. The horns of very old bulls are often worn down to little more than a foot in length. Towards the end of the dry season, when the old grass is nearly all burnt off and the new has not yet sprouted, Elands in some parts of the country (in the Mashuna country, for instance) live entirely upon the leaves of bushes; and their flesh then becomes utterly tasteless. Their flesh has been very much overestimated in my opinion, and is not to be compared for flavour with that of the Buffalo, Giraffe, Hippopotamus, or White Rhinoceros, supposing, of course, that the animals are all fat and in good condition. An Eland bull when fat can be easily run down with an ordinary horse; but the cows often run with great speed and bottom. The Elands in the Mashuna country run, I think, much harder than those in the more desert countries further west. When pursued, they often bound high into the air, higher than the backs of their fellows.

Along the Chobe, the Elands drink regularly in the river, usually during the night or just at daybreak, and then feed away through the forest-clad sandbelts, and are seldom to be met with in the middle of the day within six miles of the river. In other parts of the country, however, where for several months in the year there is absolutely no water, Elands, in common with Gemsbuck and Giraffe, live and thrive; and these desert Elands appear to me to attain to a greater size than those found in the well-watered parts of the country. In these deserts at some seasons of the year a small kind of wild melon, which contains a considerable quantity of water, is plentiful; and in September and October, which is the driest season of the year, a white bulb, looking much like a turnip and full of water, is also very common in some parts of the country; and I have no doubt that these melons and water-containing roots are largely eaten by Elands and other animals.

## 2. STREPSICEROS KUDU.

(*Koodoo* of the Dutch and English; *Tolo* of the Bechuanas; *Ee-bala-bala* of the Amandebele; *Ee-zilarwa* of the Makalakas; *Noro* of the Mashunas; *Unza* of the Masubias; *Unzwa* of the Makubas; *Muzeeloua* of the Batongas; *Dwār* of the Masaras.)

A few Koodoos still linger in the Cape Colony; and in parts of Griqualand West this Antelope is not uncommon. From the Limpopo to the Zambesi, however, and in the Manica country to the north of

the Zambesi, it is found in the neighbourhood of every river I have visited except in those places where the natives have exterminated it. It is usually partial to hilly country covered with dense thickets; but hills are by no means necessary to its existence, as it is common in the thick bush along both banks of the river Chobe, where there are no hills whatever, and it is also plentiful in the wait-a-bit thorn-jungles on the lower Molapo just on the edge of the flat and sandy Kalahari desert. The ground-colour of female Koodoos and young males is a reddish or greyish brown, with eight or nine white stripes on each side; but the old males become a deep blue-grey, which is owing, I think, as in the case of the Eland, to the colour of the skin showing through the scanty hair. The longest pair of Koodoo horns I have ever seen measured 3 ft. 8½ in. in a straight line from point to base. A pair the owner of which I shot in the Mashuna country last year measure 3 ft. 5 in. in a straight line from point to base and 5 ft. 4 in. along the curve.

### 3. TRAGELAPHUS SYLVATICUS.

(*Boschbok* of the Dutch; *Bushbuck* of the English; *Inkonka* (male), *Imbabala* (female) of the Zulus; *Serolobutuku* of the Bamangwatos; *Imbabala* (male and female) of the Amandebele, Batongas, and Masubias; *Ungurungu* of the Makubas.)

In speaking of this Antelope, I include all the Bushbucks that I have met with in different parts of the country; for, although those found on the banks of the Chobe are very different at first sight, both as regards size and colour, from those met with in the Cape Colony, I believe all to be specifically identical.

This Antelope is found everywhere in the belt of bush which runs along the coast-line of the Cape Colony and Natal, and which in some places extends to a considerable distance inland. Along the Limpopo and some of its tributaries it is also found, but does not extend its range far up the latter. Then, if we cross the watershed between that river and the Zambesi, we again meet with it on the banks of the latter river and on the lower part of some of its tributaries, such as the Gwai and Sanyati. In certain districts along the southern bank of the Chobe it is more common than anywhere else. It is, however, never met with except in places where dense bush comes right down to the water's edge; and on the Chobe, where I have seen most of these Antelopes, I have never found one at a distance of 100 yards from the river. From the Cape Colony to the Chobe all the Bushbucks I have seen have a bare place round the neck, as if they had worn a broad collar that had rubbed off all the long hair, leaving nothing but a soft velvety down. It is worthy of remark that the North-African Bushbuck (*Tragelaphus scriptus*) has not this bare place round the neck. In the Cape Colony the adult Bushbuck rams are of a deep dark brownish-black colour, with only two or three small white spots on the haunch and one or two on the shoulder. The adult females are of a light reddish brown, with white spots on the haunches and sometimes a few between the shoulder and the flank. The young rams are of a reddish brown more or less spotted.

On the Limpopo the adult rams are of a brownish grey, often without a sign of any spots, and the adult females of a dark red with a few white spots. The hair of the rams is longer than in the Colony. The young rams, however, are of a red colour and a good deal spotted, with a few faint transverse stripes; the young females are also more spotted than the old ones.

This is the Bushbuck which Gordon Cumming considered to be a new and undescribed species and named the "*Antelopeus roualeyni*," or "Bushbuck of the Limpopo." These Bushbucks are smaller than those found in the Cape Colony. If we now take the Bushbucks found on the tributaries of the Zambesi to the east of the Victoria Falls, the *adult* rams are in colour like the *young* rams found on the Limpopo, being of a dark red, thickly spotted on the haunches, shoulders, and sides with small white spots, with three or four faint white stripes down each side. The adult females are of a pale yellowish red, beautifully spotted, and also show a few faint white stripes. If we now take the Bushbucks found on the banks of the Chobe, we find that the adult male is of a very dark red colour, in places merging into a deep brownish black, most beautifully spotted with large white spots, there being as many as fifty on each side in some individuals, and in some cases as many as eight well-defined white stripes besides. There is also a mane of white hair running all down the back from the shoulder to the tail about 3 inches in length, which the animal can erect at pleasure. The young ram is of a pale reddish yellow, with the spots and stripes much more faintly marked than in the adult animal. The adult female is of a rich dark red, beautifully spotted with white, and with three or four faint white stripes on each side. There is also a deep-black line running all down the back. The young female is of a lighter red and not so much spotted.

It will thus be seen that whereas in the Cape Colony and on the Limpopo the young Bushbucks are more spotted than the adult animals, and gradually lose their markings as they become older, this order of things is exactly reversed on the Chobe and on the tributaries of the Zambesi, where the adult animals are far more beautifully marked than those that have not come to maturity. In the Cape Colony the average length of Bushbuck horns is about a foot; but they often attain a length of 14 in., and I know of one pair measuring  $16\frac{1}{2}$  in. in length. On the Limpopo, Zambesi, and Chobe it is very rare to get a pair of Bushbuck horns exceeding a foot in length.

#### 4. TRAGELAPHUS SPEKII.

(*Nakong* of the Batauwani at Lake Ngami; *Situtunga*, *Puwula*, *Unzuzu*, of the tribes on the Chobe and Central Zambesi; *N'zoé* of the natives of the Lukanga river, north of the Zambesi.)

This Antelope is only met with in the extensive swamps which exist in some parts of the interior of Africa. In the reed-beds of the Mababe, Tamalakan, and Machabe rivers it is to be found; and in the vast marshes through which the Chobe runs it must exist in considerable numbers, although, as it only emerges from the dense

reed-beds at night, it is scarcely ever to be seen. In 1879 I tried hard to shoot some of these animals on the Chobe, searching for them in a canoe amongst the reed-beds at early dawn and after sunset; but though I disturbed several, and heard them splashing away amongst the reeds and papyrus, I only saw one female alive, though one morning I found a fine ram lying dead that had evidently been killed fighting with a rival during the night. The head and feet of this animal I preserved. The female that I saw was standing breast deep in the water, in the midst of a bed of reeds, feeding on the young shoots that just appeared above the water. When she saw us she at once made off, making a tremendous splashing as she plunged through the water. The natives told me that very often when these Antelopes are met with under similar circumstances they do not attempt to run, but, sinking down in the water, submerge their whole bodies, leaving only their nostrils above the surface, and trusting that their enemies will pass them unobserved; they (the Kafirs) then paddle close alongside and assegai them from the canoe. As all the Situtungas the skins of which I saw had been killed with assegais, and not shot, I have no doubt that this statement is correct. Another way the natives have of killing them is by setting fire to the reeds when they become quite dry, and then waiting for the Situtungas in their canoes in one of the channels of open water by which the marsh is intersected. Driven forwards by the advancing fire, the Antelopes are at last obliged to swim across the open water to gain the shelter of the reeds on the further side; and the natives are thus often enabled to cut off and assegai some of them in mid stream.

I may here remark that it is a curious zoological fact that the Situtungas found on the Lower Chobe do not possess the power of being able to sleep beneath the surface of the water, or even of diving—such as is stated to be enjoyed by the same Antelopes met with by Major Serpa Pinto only about 200 miles further up the course of the same river.

An adult male Situtunga Antelope is just about the size of a male Lee-gwee, with a thick-set heavy body and very powerful neck. The hair is longer and more silky than in any other species. The longest pair of horns I have seen measured 2 ft. 1 in. in a straight line from point to base. The hoofs grow to a great length, and sometimes become white; and, as in the Lee-gwee, the space between the back of the hoof and the dew-claw is devoid of hair. In 1877 I obtained the skin of a fœtus Situtunga. The ground-colour was of a dark blackish brown, something the colour of an English mole's skin. This skin was very plainly striped and spotted with bands and spots of yellowish white, the stripes and spots being arranged as they are in the adult Busbbucks found along the southern bank of the Chobe. I had another skin of a very young animal, killed shortly after birth. This skin was already of a lighter ground-colour than that of the fœtus; and the stripes and spots had become much fainter. The skin of the adult animal is of a uniform greyish brown and altogether devoid of either spots or stripes. Like its

congener the Bushbuck, the Situtunga goes in pairs, and is not met with in herds. The females have not horns on the Lower Chobe, as they are stated to have further north by Major Pinto.

#### 5. ORYX GAZELLA.

(*Gemsbok* of the Dutch; *Gemsbuck* of the English; *Kukama* of the Bechuanas and Makalakas; *Ko* of the Masaras.)

The Gemsbuck is almost entirely confined to the arid deserts of South-western Africa. In the Kalahari desert, to the west of Griqualand West, it is fairly plentiful; and all along the road leading along the eastern border of the desert from Kuruman to Bamangwato it is occasionally to be met with, becoming plentiful if one penetrates into the waterless country to the westward, but being unknown to the eastward, of the road. Along the waggon-road leading from Bamangwato to Tati there are a few Gemsbuck about Pelatsi, Serule, and Goqui; and they are sometimes to be met with on the upper course of the Mac-loutsi, Shashi, and Tati rivers. A few sometimes even wander as far eastwards as the Ramokwebani river. On the road leading from Tati to the Zambesi Gemsbuck are not often met with; but a few are occasionally to be seen in the neighbourhood of Thammasanka and Thammasetjie. A little further westwards, however, in the neighbourhood of the great salt pans, they are numerous, as they are also in all the country between the salt pans and the Botletlie river, whilst to the west of that river, right through the desert into Damaraland, they are said to run in large herds. Where I have met with them the country has either been open or covered with stunted bush; and along the waggon-road from Bamangwato to the Mababe their northern range seems to be limited by the heavily timbered sand-belts which run east and west immediately to the south of that river, and into which the Gemsbuck does not penetrate. North of the Mababe, in the direction of the Chobe, although many parts of the country appear well fitted for them, the Gemsbuck is unknown. As far as my experience goes, the Gemsbuck is far from being the fleetest or most enduring Antelope in South Africa, and in these respects cannot be compared with the Tsessebe or Hartbeest. I do not think it is either fleetest or more enduring than the Sable or Roan Antelope; and I have myself run one to a standstill without firing a shot, and know of several other men having done the same thing. The horns of the cow become longer than those of the bull, as a rule; the longest pair of the former I have ever seen measured 3 ft. 10½ in., and of the latter 3 ft. 6 in.

#### 6. HIPPOPOTRAGUS LEUCOPHÆUS.

(*Roan Antelope* of the English; *Bastard Gemsbok* of the Colonial and Orange-Free-State Dutch; *Bastard Eland* of the Transvaal Dutch; *Qualata* of the Northern Bechuanas; *Tai-hait-sa* of the Southern Bechuanas; *Ee-taka* of the Amandebele; *Ee-pala-pala chena* (White Sable Antelope) of the Makalakas; *Impengo eetuba* (White Sable Antelope) of the Masubias; *Oo-ka-mooh-wee* of the Makubas; *Kwar* of the Masaras.)

I have twice met with the Roan Antelope to the south of Bamangwato, once on the Limpopo and once on the Notuani<sup>1</sup>. In the neighbourhood of the Tati in South-western Matabele land it is not uncommon; and all along the road from there to the Zambesi it may be met with, though nowhere plentiful; as far as I have been along the Chobe it is to be found sparingly, and also in the Mababe country. Throughout the Mashuna country it is tolerably plentiful; and in the Manica country north of the Zambesi also I saw a good many. In fact it is to be found over a vast extent of country in central South Africa, but is nowhere to be met with in very large numbers. A herd of twenty together is seldom to be seen. The Roan Antelopes differ very much one from another in colour, some being of a strawberry-roan, others of a deep dark grey or brown, and others again so light in colour as to appear almost white at a distance. The horns of the Roan Antelope bull seldom measure more than 2 ft. 6 in. in length measured over the curve, though I saw one, shot in the Mashuna country in 1878, whose horns measured 2 ft. 9 in.

#### 7. HIPPOTRAGUS NIGER.

(*Zwart Wit Pens* of the Dutch; *Sable Antelope* or *Harrisbuck* of the English; *Potoquane* of the Southern Bechuanas; *Qualata inchu* of the Bamangwatos and Makalolos; *Umtjiele* of the Amandebele; *Pala-pala* of the Makalakas; *Impengo* of the Masubias; *Ookwa* of the Makubas; *Solupe* of the Masaras.)

At the present day a few Sable Antelopes are still to be found in South-western Matabele land, in the neighbourhood of the Ramokwebani, Shashani, and Samookwe rivers (tributaries of the Shashe). Along the waggon-road leading from Tati to the Zambesi it may be met with here and there, but is decidedly scarce. All along the Chobe river, as far as I have been, I have met with this Antelope, though sparingly. In the Mababe country and on the road leading from there to Bamangwato I neither saw a Sable Antelope nor the spoor of one, and do not think its range extends so far to the west. In the broken country to the south of the Victoria Falls, in the neighbourhood of the Pendamatenka and Daka rivers, it is not uncommon; but its true home is the higher portions of the Mashuna country to the north-east of the Matabele country. There it is the commonest Antelope, and may still be met with in herds of over fifty individuals, the usual number being from ten to twenty. However large the herd, I have never seen more than one full-grown bull with it, though there may be several half-grown ones, whilst in a large herd of any other kind of Antelopes two or more full-grown males are nearly always to be seen. On the Manica plateau, north of the Zambesi, Sable Antelopes are also to be met with. The longest pair of male Sable Antelope's horns I ever saw measured 45 inches over the curve, the longest pair of female 33 inches. In the Mashuna country and along the Chobe the average length of the horns of these animals is greater than in South-western Matabele land. As a rule the Sable Antelope

<sup>1</sup> A few Roan Antelopes are still to be found in Griqualand West.

runs very swiftly and has good bottom ; but in this respect different individuals differ considerably, as is the case with all animals ; and I have run down without much difficulty individual Sable Antelopes, and Roan Antelopes, and one Gemsbuck, whilst others have gone clean away from me. The Sable Antelope is often very savage when wounded, and, like the Roan Antelope and Gemsbuck, will commit terrible havoc amongst a pack of dogs ; indeed I have known one to kill three with three consecutive sweeps of its long scimitar-shaped horns.

#### 8. GAZELLA EUCHORE.

(*Springbok* of the Dutch ; *Springbuck* of the English ; *Insaypee* of the Bechuamas ; *Eet-saypee* of the Makalakas.)

The Springbok is still found in the north-western portions of the Cape Colony, and throughout the Free State, Transvaal, and Griqualand West, where it has not yet been exterminated. Along the borders of the Kalahari desert it is common in many parts ; and on the salt pans between the Botletlie river and the waggon-road leading from Bamangwato to the Zambesi it is also plentiful. In common with the Gemsbuck and Hartebeest, however, its northern range is bounded by the thick forests which run east and west south of the Mababe river. I believe that to the west of Lake Ngami it has a more extensive range northwards.

#### 9. ÆPYCEROS MELAMPUS.

(*Ronde-bok* (pronounced *Roybok*) of the Dutch ; *Roybuck* of the English ; *Pālā* of the Bechuanas ; *Impālā* of the Amandebele ; *Ee-pālā* of the Makalakas ; *Inzero* of the Masubias ; *Umpārā* of the Makubas ; *Lubondwee* of the Batongas ; *Kug-ar* (with a click on the first syllable) of the Masaras.)

This Antelope I first met with on the Marico and Notuāni rivers, two tributaries of the Limpopo ; and from there northwards it is to be found along the banks of every river and stream wherever I have been, except in those places where the natives have exterminated or driven them away. They are nowhere more plentiful than along the Chobe, and may often be seen in herds of from twenty to a hundred together. There are very few males in comparison with the number of females, though I have sometimes seen a herd composed entirely of rams, ten or fifteen in number. They like thick cover along the river's bank, and are seldom seen at a distance of more than a mile from water, of the proximity of which there is no more certain sign than the presence of Impala Antelopes. In the rainy season they will often wander from pool to pool until they get to a considerable distance from their usual resort along a river, and thus are often found at some of the larger and more permanent vleys, such as Selinya and Boatlanarma, on the road between Secheles and Bamangwato. The Impalas found on the banks of the Limpopo are, I think, larger than those found on the Chobe, and their horns usually wider set. The largest horns I have ever seen were from the Limpopo, and measured 1 ft. 9 in. in a straight line from point to

base, with a spread of 18 inches. The largest pair I shot on the Chobe measured 1 ft. 8 in. in a straight line from point to base, with a spread of 1 ft. 4 in.; but the generality measure under 1 ft. 6 in. in length.

#### 10. CERVICAPRA ARUNDINACEA.

(*Rietbok* of the Dutch; *Reedbuck* of the English; *Imzee-gee* of the Amandebele; *Ee-bee-pa* of the Makalakas; *Im-vwee* of the Masubias; *Um-vwee* of the Makubas; *Bemba* of the Masaras.)

The first place I met with this Antelope was on the banks of the Marico river, though I believe a few are still to be found here and there in the Transvaal. On the upper portions of the Tati, Shashi, Ramokwebani, and other tributaries of the Limpopo it is to be met with; and in the Matabele and Mashuna countries on both slopes of the watershed it is very common along the banks of every river, except, of course, in the inhabited parts, where it has been exterminated. During a journey along the eastern bank of the Botletlie river in 1879, I did not see any Reedbucks; but on the Mababe, Tamalakan, Machabe, Sunta, and Chobe rivers I found them very numerous. On the tributaries of the Zambesi east of the Victoria Falls, such as the Pandamatenka, Daka, and Gwai, it is common, as also along the Nata, a river running from the Matabele country westwards into the great saltpan. In fact throughout central South Africa it is to be found wherever there are open grassy or reedy valleys intersected by a stream of water, or large reed vleys. On the Manica plateau, north of the Zambesi, Reedbucks were particularly common, and I have there seen as many as eight feeding in close proximity to one another. As a rule one seldom sees more than three or four together; and of these two are usually young. They are animals that go in pairs, and in this particular differ altogether from the Waterbuck, Leechwee, or Pookoo Antelopes, which consort together in herds, and amongst which there is not more than one male for every ten females. Although the Reedbuck is never found far from water, it always keeps on dry ground; and when chased I have never seen one take to boggy ground, but have noticed that rather than cross a narrow stream of shallow water they will make a long detour, often running the risk of being cut off thereby. When alarmed they give a shrill whistle, very similar to that emitted by the Chamois. The longest pair of Reedbuck horns that I have ever seen measured 16 inches along the curve; and I have shot two specimens myself whose horns measured 15 inches. The ordinary length is from 12 to 13 inches.

#### 11. COBUS ELLIPSIPRYMNUS.

(*Kring-gzat* of the Dutch; *Waterbuck* of the English; *Tumoga* of the Bechuanas; *Sidumuga* of the Amandebele; *Ee-tumha* of the Makalakas; *Ee-kulo* of the Masubias; *Umkulamdumbo* of the Makubas; *Mukulo* of the Batongas; *Gwelung-gwelee* of the Masaras.)

The Waterbuck is still found on the upper Limpopo and its tributaries, such as the Shashi, Tati, and Ramokwebani, in herds of from



ten to twenty individuals. On the Zambesi and all its tributaries eastward of the Victoria Falls it is very plentiful, but is never found in herds of more than about twenty together. On the Chobe and its outlet the Sunta it is to be met with sparingly; but on the Mababe and Botletlie rivers I did not meet with any at all during my visit there in 1879. It is most partial to steep stony hills, and is often found at a distance of more than a mile from the nearest river, for which, however, it always makes when pursued. Though a heavy-looking beast, it can clamber with wonderful speed and sureness of foot up and down the steepest hillsides. It appears to me that the Waterbucks found on the Upper Zambesi and its tributaries do not attain to the same size as those found on the Limpopo. On the latter river the horns often attain to a length of over 30 inches, whilst on the Zambesi and its tributaries, such as the Omniati and Ganyane rivers, which take their rise in the high plateau of the Mashuna country, it is exceptional to obtain a pair measuring over 28 inches; and the longest I have met with were a pair the bearer of which I shot myself last year (1880) on the banks of the Ganyane river. These horns measured 31 inches along the curve. The flesh of the Waterbuck is very coarse and rather strong-tasted; and when they become fat the fat sticks to the mouth and clogs on the teeth, unless eaten when very hot. Wherever I have seen them Waterbucks vary much in colour, some being reddish brown, others a very dark grey.

12. *COBUS VARDONI*. (Plate LXV.)

*Heleotragus vardoni*, Kirk, P. Z. S. 1864, p. 657.

(*Impookoo* of the Masubias.)

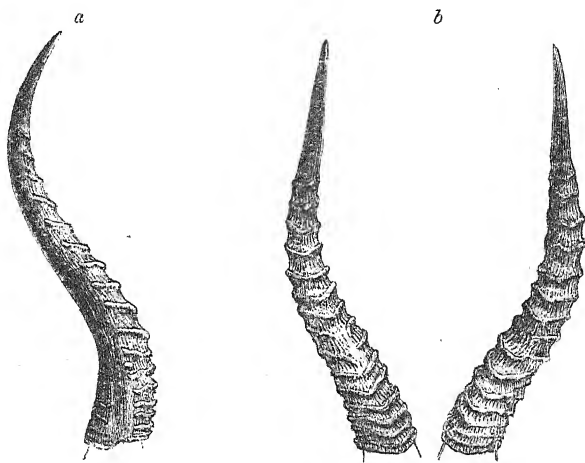
The only place where I myself met with this Antelope was in a small tract of country extending along the southern bank of the Chobe for about sixty miles westwards from its junction with the Zambesi.

They are never found at more than 200 or 300 yards from the river, and are usually to be seen cropping the short grass along the water's edge, or lying in the shade of the trees and bushes scattered over the alluvial flats which have been formed here and there by the shifting of the river's bed. Now and then a few must wander eastwards along the southern bank of the Zambesi as far as the Victoria Falls, as I saw my friend Mr. J. L. Garden shoot one in 1874 which was standing on the very brink of the precipice. This, however, is the only one I have ever seen to the east of Umparira, though I have been several times backwards and forwards along the river's bank between that place and the Victoria Falls since. Along the Upper Zambesi from Sesheke to the Baroutse valley the natives report them common. Why the Pookoo does not extend its range further westwards along the southern bank of the Chobe I am at a loss to understand, as there does not appear to be any change in the character of the country or vegetation to account for it.

In size this Antelope stands about the same height at the shoulder as the Impala, but, being stouter built, must weigh considerably more. The colour is a uniform foxy red, the hair along the back

about the loins being often long and curly. The tips of the ears are black. The males alone bear horns, which are ringed to within three inches of the point, and curve slightly forwards. A fine pair will measure 16 inches along the curve.

These Antelopes are usually met with in herds of from three or four to a dozen in number; but in 1874, on one of the alluvial flats near the mouth of the Chobe, I observed as many as fifty in one herd, and once I saw twelve old rams together. During the period of anarchy, however, which ensued after Sepopo was murdered in 1876, a great many of the natives fled from Sesheke to the southern bank of the Chobe, and during their sojourn there committed great havoc amongst



Horns of *Cobus vardoni*.

a. Side view; b. front view.

the numerous herds of Pookoo; so that on my visit to the Chobe in 1877 I never saw more than ten or a dozen in a herd, and not one for every ten I had seen there in 1874. They are usually found on dry ground close to the water's edge, but when pursued do not hesitate to cross marshes or swim deep rivers. I have often seen Pookoo and Impala Antelopes feeding together, but have never seen the former Antelopes in company with Leechwee, for the reason that on the southern bank of the Chobe near its junction with the Zambesi, where the Pookoo are found, there are no Leechwee, whilst in the swamps on the other bank, where Leechwee abound, there are no Pookoo.

### 13. COUS LECHE.

(*Leché*, *Lee-gwee* of the Makalolo; *Inya* of the Masubias; *Oonyia* of the Makubas.)

This Antelope is first met with in the marshes of the Botletlie river,

and is very numerous in the open grassy plains which are always more or less inundated by the Tamalakan, Mababe, Machabe, Sunta, and Chobe rivers. It is also common along the upper Zambesi. In the swamps of the Lukanga river, about 150 miles to the south-west of Lake Bengweolo, which I visited in 1878, I found the Lee-gwee Antelope in large herds.

After Speke's Antelope, the Lechee is the most water-loving Antelope with which I am acquainted, and is usually to be seen standing knee deep, or even up to its belly, in water, cropping the tops of the grass that appear above the surface, or else lying just at the water's edge. As is the case with *Tragelaphus spekii*, the backs of the feet are devoid of hair between the hoof and the dew-claws, whilst in the Pookoo, as with all other Antelopes, this part is covered with hair. In some parts of the country Lee-gwee Antelopes are very tame; in others, where they are much persecuted by the natives, excessively wild. When they first make up their minds to run they stretch out their noses, the males laying their horns flat along their sides, and trot; but on being pressed they break into a springing gallop, now and then bounding high into the air. Even when in water up to their necks, they do not swim, but get along by a succession of bounds, making a tremendous splashing. Of course, when the water becomes too deep for them to bottom, they are forced to swim, which they do well and strongly, though not as fast as the natives can paddle; and when the country is flooded, great numbers are driven into deep water and speared. In the adult Lee-gwee the ears are of a uniform fawn-colour; but in the young animal they are tipped with black as in the adult Pookoo. In the flooded grassy plains in the neighbourhood of Linyanti on the Chobe, this beautiful Antelope may be seen in almost countless numbers, and I have counted as many as fifty-two rams consorting together. Some of these were quite young, with horns only a few inches in length; but there was not a single ewe amongst them. The longest pair of Lee-gwee horns that I have ever seen measured 2 feet 3 inches in length; but it is rare to get them over 2 feet long measured along the curve. In common with the Pookoo, they appear to me to be more tenacious of life than other Antelopes.

14. NANOTRAGUS SCOPARIUS (Schreb.): Brooke, P. Z. S. 1872, p. 642.

(*Oribi* or *Oribiki* of the Dutch; *Oribi* of the English.)

North of the Limpopo, this Antelope is only to be met with in the following districts, viz. in North-eastern Mashuna land from the river Umzweswe to beyond the river Hanyāne, in the open valleys which occur between the forest belts near the watershed but to the north of the Machabe hills; on the exposed open downs nearer the watershed, and lying between the Machabe hills and Intaba Insimbi, I never saw any. On a large flat about fifty miles to the south of the junction of the Umfule and Umniati rivers, I saw a good many *Oribi* in 1880. Except in this district of the Mashuna

country, the only place south of the Zambesi where this Antelope exists is in the valley of Gazuma, an open boggy flat only a few hundred acres in extent, which is situated at a distance of about 30 miles to the south-west of the Victoria Falls. Then again a few are to be seen on the northern bank of the Chobe, on the open ground bordering the marsh, in the neighbourhood of Linyanti. North of the Zambesi they are reported by the natives to be very common on the Shesheke flat; and on the open downs of the Manica plateau I found them very numerous. One never sees more than two or three of these Antelopes together. The horns of the male attain to a length of about 5 inches, and are ringed at the base.

#### 15. NANOTRAGUS TRAGULUS (Licht.).

(*Steinbok* of the Dutch; *Steinbuck* of the English; *Ingnweena* of the Amandebele; *Puruhuru* of the Bechuanas; *Ee-pen-nee* of the Makalakas; *Kahu* of the Masubias; *Kimba* of the Batongas; *Gai-ee* of the Masaras.)

This little Antelope is found all over South Africa, from the Cape to the Zambesi, except in the mountainous districts and tracts of very thick bush; it is fond of rather open country or open forest. Its horns attain sometimes a length of 5 inches, though from 3 to 4 inches is the usual size. North of the Zambesi I did not see any Steinbucks.

#### 16. NANOTRAGUS MELANOTIS (Thunb.).

(*Grys Steinbuck*, *Sash-lungwān* of the Amandebele; *Teemba* of the Makalakas.)

This little animal is only met with, north of the Limpopo, in certain hilly districts of the more easterly portions of the interior. In the country inhabited by the Amandebele it exists, but is very scarce; but to the north and east, in all the hilly country in the neighbourhood of the Victoria Falls, and throughout the Mashuna country from the watershed to the Zambesi, it is fairly numerous. North of the Zambesi, as far as I penetrated, I met with the Grys buck.

#### 17. NANOTRAGUS OREOTRAGUS (Schreb.): Brooke, P. Z. S. 1872, p. 642.

(*Klipbok* or *Klipspringer* of the Dutch and English; *Ee-go-go* of the Amandebele; *Ingululu* of the Makalakas; *Gereree* of the Batongas; *Kululu* of the Masaras.)

This little Antelope is found from the Cape to the Zambesi wherever there are stony hills. North of the Zambesi I did not see any. It is particularly plentiful in the curious detached stony hills of the Matabele and Mashuna countries. The horns of the males attain to about 4 inches in length, the females being hornless. The hoofs of this Antelope are very much like those of the European Chamois, being very short and small, and the hollows in them being very deep. All four hoofs could easily be placed on a penny piece. This enables them to obtain a foothold on little projecting pieces

of rock, as they bound up the sides of rocks that appear as steep as the side of a house. The coat of the Klipspringer is very peculiar, each separate hair being hollow. It makes excellent padding for saddles, being very light and elastic.

#### 18. CEPHALOPHUS MERGENS.

(*Duiker* of the Dutch and English; *Puti* of the Bechuanas; *Impunzi* of the Amandebele; *Pemb-gee* of the Makalakas; *Unsa* of the Masubias and Makubas; *Insea* of the Batongas; *Goo-wah* of the Masaras.)

Wherever I have been, both north and south of the Zambesi, except in districts devoid of bush or covered with steep rocky hills, I have met with this Antelope. I have, however, only met with one species, though different individuals vary very much in colour, even though shot in the same district. Some skins are of a greenish colour, others of a reddish brown; and some that I shot on the borders of the Kalahari had less white about the belly than those I obtained further to the north-east. The longest pair of Duiker horns I have seen measured 5 inches in length, the usual length being 3 or 4 inches. They are ringed at the base. Although the females are almost always hornless, I have met with three examples bearing horns. One I shot myself on the Shashi in September 1876; another was shot by Mr. Thomas Ayres in May 1880, near the junction of the Marico and Limpopo rivers, and a third by Mr. Edward Sefton near Zeerust in the Transvaal.

#### 19. ALCELAPHUS CAAMA.

(*Hartebeest* of the Dutch and English; *Khama* of the Bechuanas; *Ingama* of the Makalakas; *Khama* (with a click) of the Masaras.)

The range of this Antelope is very similar to that of the Gemsbuck. It is still found in Griqualand West, in some parts being fairly plentiful. All along the eastern border of the Kalahari desert it is also to be found, and extends as far east as the river Serule on the road from Bamangwato to Tati. In the neighbourhood of the salt-pans lying between the Botletlie river and the road from Bamangwato to the Zambesi it is very plentiful and may be met with in large herds. It does not, however, extend its range to the north of these salt-pans, and is unknown in all the country between the Chobe and Mababe rivers, as it is also in the Matabele and Mashuna countries. It is very fleet and enduring, and only second in these particulars to the Tsessebe.

#### 20. ALCELAPHUS LICHTENSTEINI.

(*Konze* of the Masubias; *Inkulanondo* of the Mashunas.)

This Antelope I only met with on the open downs of the Manica plateau, north of the Zambesi. As I have only seen the horns of the Inkulanondo (which exists in the neighbourhood of the river Sabi, in South-eastern Mashuna land, and in Unzeilas country), it may not turn out to be identical with the Konze, though Sir

Victor Brooke, to whom I sent an example of the horns, thinks it will probably prove to be the same animal.

The Konze very closely resembles the Hartebeest of South Africa; the horns, however, are shorter and flatter at the base, and the forehead is not nearly so elongated. The black mark down the front of the face of the Hartebeest is also wanting in the Konze, where the colour is of a uniform light red. The general colour of the animal is a little lighter than that of the Hartebeest, the tail, knees, and front of all four legs being black. As in the Hartebeest, there is a patch of pale yellow on the rump; and the insides of thighs and belly are also of a very pale yellow. One old bull that I shot was of a very rich dark red colour all along the back and the upper part of the sides. About a hand's breadth behind each shoulder was a patch of dark grey about six inches in diameter. A female that I shot also had these grey patches behind the shoulders. In two other full-grown males these patches were wanting.

## 21. ALCELAPHUS LUNATUS.

(*Bastard Hartebeest* of the Dutch and English; *Tsessebe* of the Bechuanas; *Incolomo* and *Incomazan* of the Amandebele; *Inkweko* of the Masubias; *Unchuru* of the Makubas; *Inyundo* of the Makalakas; *Luchu* of the Masaras.)

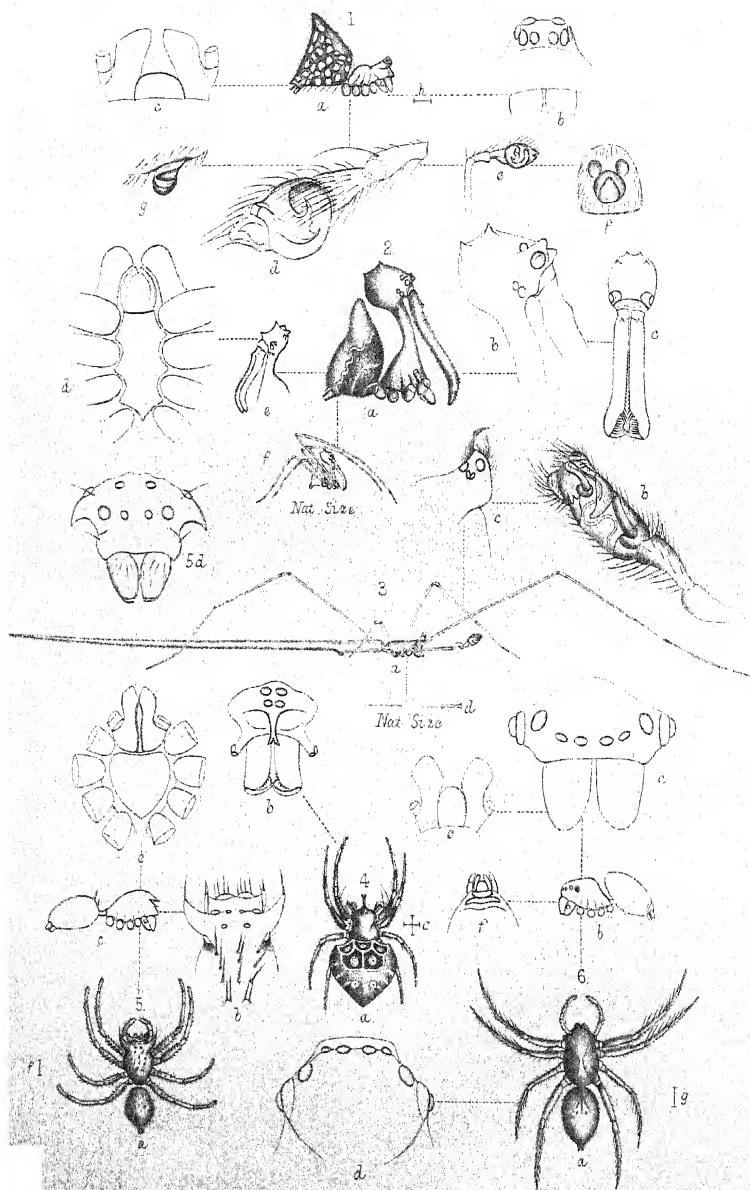
In travelling up the centre of South Africa the first place in which this Antelope is to be met with now-a-days is in the neighbourhood of the Marico river, a tributary of the Limpopo; and from there it is found throughout central South Africa wherever I have been, south of the Zambesi, in all those parts of the country that are suitable to its habits. I say south of the Zambesi, because during my journey through the Manica country to the north of that river in 1877-78, although the terrain appeared well suited to its habits and requirements, I saw none of these Antelopes. I have heard, however, from the natives that they are very common in the neighbourhood of Sesheke.

This Antelope is never found in hilly country or in thick jungle, but frequents the open downs that are quite free from bush, or else open forest country in which treeless glades are to be met with. On the Mababe flat at the end of the dry season large herds of these animals congregate together, and I have often seen, I am sure, several hundreds of them at once. They are without exception the fleetest and most enduring Antelope in South Africa. In 1879 all the Tsessebe and Blue Wildebeest cows calved on the northern bank of the Chobe during the first week in September, whilst on the Mababe flat, only about one degree further south, the same animals did not calve before the first week in November.

## 22. CATOBLEPAS GORGON.

(*Blau Wildebeest* of the Dutch; *Blue Wildebeest* of the English; *Kokön* of the Bechuanas; *Inköne-köne* of the Amandebele; *Le-vumba* of the Makalakas; *Numbo* of the Masubias; *Minyumbwe* of the Batongas; *Unzozo* of the Makubas.)





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New Araneidea



This animal is met with on the western borders of Griqualand West, and all along the eastern edge of the Kalahari desert, and all over south Central Africa wherever I have travelled from the Limpopo to the Zambesi; and from the Mashuna country to Lake Ngami it is to be found in those districts that are suitable to its habits. Like the Tsessebe it is partial to open downs devoid of bush, or open glades in the forest, and is never met with in hilly countries. On the Mababe flat it congregates in immense herds during the dry season. In the Manica country, north of the Zambesi, I did not see any Blue Wildebeest; but the natives told me that to the west of the river Kafukwe, in the country of the Mashukulumbwe, they were plentiful. The horns of the males attain a spread of from 2 feet 2 inches to 2 feet 5 inches. It is very common to see one Blue Wildebeest feeding in company with a herd of other Antelopes, such as the Tsessebe, or with a herd of Zebras or Ostriches. The Blue Wildebeest is very swift and enduring.

5. On some new Genera and Species of Araneidea. By the  
Rev. O. P. CAMBRIDGE, M.A. &c.

[Received June 7, 1881.]

(Plate LXVI.)

Six Spiders only are described in the present short paper—four of them from the Amazons, one from Ceylon, and one from Madagascar. They have not been designedly selected for the purpose; but, as it happens, two of them represent, perhaps, the most extreme known instances of eccentric development—one of the *caput*, the other of the *abdomen*. It is difficult to imagine any possible utility to the Spider in such developments, while it is not so difficult to conjecture some disadvantages. This, however, in the absence of information as to the life and habits of the Spiders, is, of course, mere conjecture. The development of *abdomen* referred to is in *Ariamnes attenuata*, sp. n. In this Spider the posterior extremity of the abdomen of the male is produced to an extent of very nearly (if not quite) *eight times* its normal length. That of the female is also much produced, but not to so great an extent. In the other instance, the *caput* of *Eriauchenus workmanni* (gen. et sp. nn.) is not only elevated to an almost unprecedented height, but it furnishes the only instance known to me in which *the elevation of the ocular area* (of itself not an unusual occurrence in the Araneidea) has, as it were, carried up with it the lower margin of the caput, and so necessitated a corresponding development in the length of the *falces*. Of the remaining Spiders, *Thwaitesia margaritifera* (gen. et sp. nn.) is one of exceedingly delicate beauty, the silvery pearl-like scales on its abdomen forming a most beautiful object for the microscope; and *Bucranium taurifrons* (gen. et sp. nn.) has enabled me to fix (I think, without doubt) the hitherto doubtful systematic position of

*Aphantochilus*, Cambr. (P. Z. S. 1870, p. 744). This latter genus was conjectured to belong to the Myrmecidæ; but I have now no hesitation in forming for it and the genus *Bucranium* a separate family (Aphantochilidæ), near to the Thomisidæ. More extended remarks on all these points will be found in the subjoined descriptions.

## Order ARANEIDEA.

### Fam. THERIDIIDÆ.

#### Gen. nov. THWAITESIA.

This genus is nearly allied to *Theridion*, but may be easily distinguished by the conically elevated abdomen, the shorter, stronger maxillæ, the more prominent ocular area, the larger eyes, which, although preserving a similar general arrangement, are divided into two well separated groups of four each, each group formed by one of the lateral pairs and the hind and fore lateral eye next to it, all four being almost, or quite contiguous to each other; the fore central pair are smallest, and form a shorter line than the hind centrals. The legs also are armed with distinct spines on the genual and tibial joints of all four pairs; while the metatarsi and tarsi of the fourth pair are armed with numerous spine-like bristles, a row near the inner side of the tarsi being curved and serrated. This latter armature, however, is much less strong in the male than in the female; indeed in the male I could not distinguish any serrations. The relative length of the *legs*, which are rather long and slender, is, as far as I could judge from the damaged condition of some portions, 4, 1, 2, 3, the difference between those of the first and fourth pairs being but slight. The falces are weak, straight, and subconical, and the fang likewise small and weak. The sternum is heart-shaped.

THWAITESIA MARGARITIFERA, sp. n. (Plate LXVI. fig. 1.)

Length of the adult male  $1\frac{1}{2}$  line, that of the female being rather more than 2 lines.

The *cephalothorax* is pale yellow, some examples having an indistinct reddish-brown central line from the occiput backwards; and two (females) had a broad brown central band from and including the eyes to the hinder extremity of the thorax. The thorax is gibbous above, with the thoracic indentation strong; the ocular area of the caput projects forwards, the eyes (disposed as above mentioned) occupying the whole of the upper extremity of the caput; the height of the clypeus considerably exceeds half that of the facial space, and projects well forwards.

The *legs* are similar in colour to the cephalothorax, the articulation of the tibiæ and metatarsi of the first and fourth pairs having a tinge of reddish brown, and a portion at the extremities of the metatarsi of these pairs being also dark reddish brown. On the upper side of each of the genual joints is a distinct black spine; and on each of the tibiæ are two others, one near the middle and one near the anterior extremity.

The *palpi* of the male are rather long, and similar to the legs in colour; the cubital joint is slightly curved, clavate, and a little longer than the radial joint, with a strongish, dark, curved, tapering bristle directed forwards from its anterior extremity, and a similar one at the extremity of the humeral joint. The digital joints are rather large, oval, with a strong cleft lobe on the inner side, and of a yellow-brown colour; their convex sides are directed towards each other.

The palpal organs are rather complex; a black, filiform, closely adhering spine issues from the middle of their outer or (as they stand in the position in which the palpus is held) upper side, and passing backwards round their margin, terminates near their fore extremity on the inner, or lower, side.

The *falces*, *maxillæ*, *labium*, and *sternum* are similar in colour to the *cephalothorax*.

The *abdomen* looked at in profile is somewhat quadrate, one corner (the upper one) being considerably produced, or elevated; in the male its height is distinctly less than the length of the Spider, but in the female it is nearly, and sometimes quite, equal to the length of the Spider. It is of a dull luteous yellowish colour (possibly brighter in the living Spider), its upper and lateral surface more or less thickly covered with scale-like plates of a brilliant silvery pearly nature and of an irregular form. In some examples these plates show very little space between them; in others there is a considerable interval. The genital aperture of the female has a small but characteristic and prominent process connected with it.

Of all the Spiders I am yet acquainted with this is perhaps the most delicately beautiful in the abdominal adornment, to which it would be impossible for any pencil to do adequate justice.

Eight females and one male were included in collections received several years ago from Ceylon, from Mr. G. H. K. Thwaites, to whom I have dedicated the new genus considered necessary for the reception of this pretty Spider.

#### Gen. nov. ERIAUCHENUS.

*Caput* elevated, with a long neck, carrying with it not only the eyes but the *falces* also, which are abnormally produced so as to meet the *maxillæ*.

*Eyes* unequal in size, in four pairs; two pairs on each side of the *caput*, near the insertion of the *falces*; those of the lower pair on each side represent the ordinary lateral pair, and are contiguous to each other, while those of the upper pair, on each side, represent the fore and hind central pairs, the eyes of each of the two latter pairs being abnormally separated.

*Legs* long, slender, 1, 2, 4, 3; furnished with hairs only. Terminal tarsal claws three, articulated to a small supernumerary claw-joint.

*Maxillæ* strong, slightly curved, and inclined towards the *labium*, which is large, somewhat pointed at its apex, where it is slightly notched, and broader across the middle than at the base or apex.

*Sternum* elongate, strongly dentated or notched on its sides, at the insertion of the legs.

*Abdomen* of a subtriangular form, the upper side being considerably and conically elevated.

*ERIAUCHENUS WORKMANNI*, sp. n. (Plate LXVI. fig. 2.)

Immature male, length from the spinners to the extremity of the maxillæ  $2\frac{1}{2}$  lines; height from the sternum to the highest point of the caput  $2\frac{1}{2}$  lines.

The *cephalothorax* converges gradually upwards to the anterior portion, which is produced perpendicularly into a longish cylindrical neck, terminating with a large massive caput, the occipital region of which is rounded, and the upper side somewhat flattened and sloping gradually to the insertion of the falces; at the summit of the caput are four small, pointed, tubercular eminences in the form of a quadrangle whose posterior side is narrower than the rest. The colour of the cephalothorax, neck, and caput is yellow-brown, marked in parts with a darker hue, and thinly clothed with short grey hairs; just beneath the caput the neck is paler, giving the appearance of a broad pale neck-collar. The whole height of this extraordinarily developed cephalothorax to the top of the caput equals the length of the Spider.

The *eyes* are in two groups, one on each side of the fore extremity of the caput close to the margin. Each group consists of two pairs, an upper and lower one; the anterior eye of the upper pair is much the largest of the group, and is seated in front and rather at the side of a strong bluntish-pointed tubercular prominence, and close to the margin of the caput; behind this eye is seated the other eye of the pair; this posterior eye is much smaller and very difficult to discern: taking the two posterior eyes, of the upper pair on each side, as representing the ordinary hind central pair, they are nearer together than those of the fore central pair, *i. e.* the anterior eyes of the two upper pairs. The lower pair is considerably removed from the upper one; its eyes are contiguous to each other, and of a pale whitish yellow-brown colour, so like that of the surrounding surface as to be almost imperceptible; their position is very close to the base of the falces on the outer side, about an eye's diameter from the margin of the clypeus, at the middle of which is a prominent point.

The *legs* of the first pair are upwards of five times the length of the Spider, and are considerably longer than any of the rest. All are of a yellowish-brown hue, the femora clouded in parts with a deeper colour; those of the fourth pair are mostly of a paler yellowish hue with a distinct broadish black-brown annulus about the middle; a broader but less distinct annulus is also placed near the hinder extremity of the tibiæ of the third pair; some indistinct annuli, of a darker yellow-brown than the rest of the surface, are also visible on the more or less mutilated portions of the tibiæ and of the metatarsi of the third and fourth pairs. The three terminal tarsal claws, placed at the extremity of a small supernumerary claw-joint, are small and strongly bent; the superior claws appeared to have only one or two denti-

culations. The legs are furnished thinly with hairs, some of which are short and grey.

The *palpi* are short; the digital joint tumid and longer than the radial, which is also longer than the cubital. They are similar in colour to the legs.

The *falces* are of great length, slender, and rather divergent at the extremities, which have also a backward bend; their length is about equal to that of the Spider itself; towards the base, on the upper side, is a strongish conical point or prominence. Their colour is similar to that of the cephalothorax, indistinctly but broadly banded with a deeper hue, furnished thinly with grey hairs, and armed on the inner sides throughout with a longitudinal series of denticulations increasing in strength from the base to the extremity, being exceedingly minute at the base, but rather long and strong at the beginning of the divergent portion, whence to the fang is a series of another kind with a more direct transverse or lateral direction, and giving a comb-like appearance. The fang is strong and much curved at its point.

The *maxillæ* are similar in colour to the falces, and the *labium* and *sternum* are of a darker hue; the form of these parts is described in the generic characters given above.

The *abdomen*, whose height is greater than its length, is yellow-brown above, much darker on the sides, the one being separated from the other by a bluntly dentated or zigzag line of short white hairs. Some indistinct markings formed by lines of white hairs are also visible on the upper side. The underside is dark brownish, variegated with bars and blotches of white hairs. The spinners are compactly grouped; those of the inferior pair are two-jointed, and are the longest and much the strongest of the six.

A single immature example of this most remarkable Spider, found in Madagascar, was kindly sent to me by Mr. T. Workman of Belfast, who has also permitted me to describe and figure it. It is of great interest, not only on account of its singularly elevated caput, but because the elevation is of a type quite distinct from any thing I have ever before met with. Some species of *Walckenaera* have the upper part of the caput elevated to a great height, and the eyes are (some or all) carried up with it; but in the present Spider not only the eyes but the falces also are carried up, necessitating the extraordinary development of the latter to enable them to meet and cooperate with the other parts of the mouth. These would otherwise have been left open and exposed, and the Spider itself would have been in danger of starvation, since the anterior extremities of the falces, with their fangs and teeth, are the main instruments for holding and compressing the Spider's prey, the juices of which flow thence into the mouth itself.

I have no hesitation in founding a new genus on this Spider; and very probably the future discovery of other, allied, species will necessitate the formation of a new family for them. At present I would place it in the family Theridiidæ, in a separate group, near the genera *Argyrodes*, Latr., and *Ariamnes*, Thor.

In the absence of spines on the legs there is a close approach to *Theridion*, Walck., while in their relative length they are like *Linyphia*, Latr. Although the development of the caput is so strong, yet in the adult it would be probably found to be of a still stronger and more extraordinary nature.

Gen. ARIAMNES, Thor. (*Ariadne*, Dol.).

ARIAMNES ATTENUATA, sp. n. (Plate LXVI. fig. 3.)

Adult male, length 8 lines; length of cephalothorax  $\frac{3}{4}$  line; length of spinners  $1\frac{2}{3}$  line; length of abdomen  $6\frac{1}{2}$  lines.

The whole of the fore part of this Spider, including the legs and palpi, is of a dull yellow-brown colour. The abdomen is of a still duller hue, thinly mottled (chiefly on the sides) with small yellowish silvery spots.

The *cephalothorax* is of a rather flattened oblong form, the caput being a little drawn out and elevated at its fore extremity, ending in a short, somewhat conical point in the middle of the ocular area, which is furnished with strong hairs; some of these form a somewhat horn-like tuft and are curved forwards, meeting others curved in an opposite direction.

The *eyes* are unequal in size; those of the fore and hind central pairs (the first being the largest) form a large square surrounding the conical eminence of the caput; the lateral pairs are rather close to the others on either side; those of each lateral pair being contiguous to each other.

The *legs* are long, very unequal in length, 1, 4, 2, 3, slender, furnished with very short fine hairs only.

The *palpi* are long; the cubital joint curved, clavate, and longer than the radial, which is also curved, and enlarged gradually to its fore extremity; the digital joint is large, of an oblong-oval form, somewhat split or bifid at its fore extremity. The palpal organs are complex, composed of variously formed corneous processes, but all tolerably compact.

The *falces* are rather small and weak, straight, and nearly vertical.

The *maxillæ* are strong, especially at their base, inclined towards the labium, and obliquely truncated at the extremity on their outer sides.

*Labium* short, of a somewhat subtriangular form, and its junction with the sternum scarcely perceptible.

*Sternum* large, of an elongate triangular shape, strongly hollowed or indented between the insertions of the legs.

*Abdomen* narrow, and drawn out at its hinder extremity in an exceedingly long tapering cylindrical form, terminating gradually in a fine sharp point. The spinners are compact, and placed beneath the abdomen at a distance from the cephalothorax rather exceeding the length of the latter; the produced portion of the abdomen is more than seven times the length of the rest, *i. e.* from the spinners to the cephalothorax. The abdomen is furnished with hairs, which become longer, coarser, and more abundant towards the hinder extremity.

The female differs from the male chiefly in the abdomen being not quite so long, and the caput wanting the elevation of the fore part.

This curious Spider is nearly allied to *Ariamnes* (*Ariadne*) *flagellum*, Dol., but is, I think, quite distinct. The extraordinary development of the posterior part of the abdomen is perhaps one of the eccentricities in the Spider world least easy to be accounted for. Both sexes were contained in the collection of South-American Spiders sent to me by Prof. Traill, and were found on the Amazons.

Fam. GASTERACANTHIDÆ.

Gen. MUTINA, Cambr.

MUTINA FURCIFERA, sp. n. (Plate LXVI. fig. 4.)

Length of the adult male  $1\frac{2}{3}$  line; breadth of the abdomen at its widest part  $1\frac{1}{2}$ .

This curiously formed Spider is nearly allied to *Mutina prospiciens*, Cambr. (Ann. & Mag. N. H. ser. 4, vol. xiv. p. 175, pl. xvii. fig. 3, 1874), described under the generic name of *Calydna*, which, having been found to be preoccupied, was changed to *Mutina* (vide Zool. Rec. xi. p. 231).

The present Spider, however, may be at once distinguished by the simpler and more cylindrical form of the remarkable processes at the extremity of which the lateral pairs of eyes are seated, and especially by the equally long corneous nose-like process issuing from the clypeus immediately beneath the four central eyes; this process, which is of a cylindrical form, is a little bent, and points rather downwards; it is smallest in the middle, gradually lessening from the base, and enlarging again towards its extremity, where it is strongly and very distinctly bifid or forked.

The *cephalothorax* is somewhat elongated quadrate, strongly constricted on the margins and sides at the caput. The four central eyes are placed at the fore extremity of a slightly prominent portion of the caput; they are rather large, and describe very nearly a square whose fore side is rather the shortest. The colour of the cephalothorax is a deep reddish yellow-brown, the fore part being the palest.

The *legs* are rather short, moderately strong, 1, 2, 4, 3, furnished with hairs and a very few long bristles; a short strongish spine issues from a tubercle in front of the femora of the second pair, and some very short, somewhat tuberculiform spines in a single row along the underside of the tibiæ of the same pair. The colour of the legs is yellow-brown; the femora and fore part of the tibiæ of the first and second pairs strongly suffused with dark brown, as also are the femora of the fourth pair.

The *palpi* are very short; the digital joint is large, and the palpal organs complex and enormously developed.

The *abdomen* is of a short heart-shape and of a dull brownish yellow hue. The upper surface is rather flat, corneous, and presents traces more or less distinct of the various sigilliform markings characteristic of the Gasteracanthidæ. A kind of corneous point terminates the underside of the connecting pedicle, and projects

beneath the posterior extremity of the sternum; but it does not appear (as was suggested, Ann. N. H. loc. cit.) to be articulated or fixed to it.

A single example received from the Amazons was in Mr. Traill's collection.

Fam. APHANTOCHILIDÆ.

Gen. nov. BUCRANIUM.

This genus is allied to *Aphantochilus*, Cambr., but may be readily distinguished by its shorter form and the absence of constriction on the posterior part of the cephalothorax. The *labium* also, though very attenuated, is perfectly visible; and the *sternum*, instead of being very narrow and duplex, is of an ordinary and rather broad heart-shape.

The generic characters may be stated as follows:—

*Cephalothorax* oval, broad, and truncated before, with a strong marginal lateral constriction at the caput. A strong, curved, tapering pointed horn-like projection issues laterally and forwards from each side of the anterior portion of the upper part.

The *eyes* are unequal in size and placed in two transverse rows; the anterior row straight, the posterior strongly curved, the convexity of the curve directed forward; those of each lateral pair, which are the largest of the eight, are widely separated from each other, and issue from close to the base (before and behind) of the horns. The four central eyes form a square whose anterior side is shortest.

*Legs* not very long, slender, subequal in length, 4, 1, 2, 3, or 1, 4, 2, 3; furnished with hairs and a few short spines, the latter on the femora only. Each tarsus ends with three claws and a very small claw-tuft.

*Maxillæ* long, very strong at their base; the upper parts much less strong and just meeting over the *labium*, which is long, very narrow, and pointed at its apex, being in fact of a lanceolate form.

The *sternum* is short, broad, heart-shaped; the anterior margin slightly hollowed. The *abdomen* is short, somewhat oval, and separated from the cephalothorax by a distinct though not very long pedicle.

BUCRANIUM TAURIFRONS, sp. n. (Plate LXVI. fig. 5.)

Length of an immature female,  $1\frac{1}{4}$  line.

The *cephalothorax* is yellow-brown, palest on the upper part of the caput; its surface is covered with small tubercles or granulosities, among which are ten or twelve stronger ones, armed with long, strong spines; the two strongest of these tubercles are placed in a short transverse line close to the thoracic indentation, and each is armed with two spines, the rest having but one each.

The *clypeus* is very broad, projecting, and quadrate, with a strong subconical prominence at each of its lower corners, terminating with a prominent spine; the height of the clypeus is equal to nearly half that of the facial space. Besides the spines already noted, each of



the horn is continued by a strong one; and there are others also, less strong, issuing from the ocular area and clypeus.

The *eyes* of the lateral pairs are considerably larger than the rest, the fore laterals being, apparently, rather the largest; the interval between those of the fore central pair is distinctly greater than that between each and the fore lateral next to it, while that between the hind centrals is considerably less than that between each and the hind lateral next to it.

The *legs* are yellow-brown, somewhat suffused with a more dusky hue; the genual, tibial, and metatarsal joints marked longitudinally with a white stripe. The *tarsi* are equal in length and strength to the metatarsi, and cylindrical in form.

The *palpi* are similar in colour to the legs, short, strong; radial joint short, digital tapering, and furnished with short strong spines.

The *falces* are short, strong, straight, vertical, subconical; similar in colour to the cephalothorax, and furnished with a few prominent spine-like bristles in front.

The *maxillæ*, *labium*, and *sternum* are similar to the legs in colour.

The *abdomen* is of a dull yellowish hue tinged with brown; two tubercles form a transverse row towards the anterior margin; from each issues a strong dark vertical spine, two finer spines also form another transverse row in front below the anterior margin; and the surface of the upper side generally is furnished with short and still finer pale spines. The spinners are small and short.

An example of the female, which had not attained maturity, was contained in the collection received from the Amazons. The *cephalothorax* of a considerably larger specimen (wanting the abdomen and some of the legs) differed in the larger size of the tubercles and granulosities, and was of a much deeper hue. This was probably an adult example.

The genus *Aphantochilus*, Cambr. (P. Z. S. 1870, p. 744, pl. xliv. fig. 10), was placed provisionally in the family Myrmecidæ. Subsequent examination and consideration, however, led me to conclude without any doubt that its true position was, if not among, at least near the Thomisidæ. The examination of the present genus, which much resembles, and is closely allied to *Aphantochilus*, induces me to include the two in a separate family next to the one before mentioned.

#### Fam. PERISSOBLEMMIDÆ.

##### Gen. nov. PERISSOBLEMMMA.

##### *Characters of the Genus.*

*Cephalothorax* rather oblong, oval, with a broad ocular area; very convex above; lateral marginal constriction at the caput very slight, as also are the normal indentations; thoracic junction prominent and elevated, and, when looked at in profile, considerably higher than the ocular area, which occupies the whole width of the fore part of the caput.

*Eyes* considerably unequal in size; the four smallest form a slightly curved transverse line a little way above the falces; in continuation of the curve, at each end of the line, is a much larger eye, with another beyond it, behind, and lower down, seated on a strong tubercular prominence. The eight eyes may thus be said to form only one long transverse sinuous line, a position very unusual, and, in fact, almost (so far as I know) unique among the eight-eyed Spiders, approaching, however, somewhat near to that of *Selenops*, Dup.

*Legs* rather short, laterigrade, not very strong, but tapering, not very unequal in length, (so far as I could ascertain) 1, 2, 4, 3—1, 2 and 4 being very nearly equal, and 3 being not much shorter. They are furnished with hairs and also with long spines beneath the tibiae and metatarsi, arranged in two (parallel) rows, and terminate with three tarsal claws, the two superior ones curved and pectinated, the inferior one very small and most strongly curved.

*Palpi* moderately long, and terminating with a curved pectinated claw.

*Falces* short, conical, strong, and vertical.

*Maxillæ* moderate in length and strength; enlarged and rather divergent at their extremities, where they are rounded on the outer sides.

*Labium* somewhat oblong, (apparently) a little rounded at the apex, and about half the length of the maxillæ.

*Sternum* small, oval, pointed at its posterior extremity.

*Abdomen* short-oval, fitting well up to the base of the cephalothorax. Spinners small, two-jointed. The anal tubercle is apparently two-jointed, and follows several rather conspicuously marked transverse folds in the epidermis, denoting no doubt obsolete segments of the abdomen.

PERISSOBLEMMATA THOMISIFORME, sp. n. (Plate LXVI. fig. 6.)

Length of an immature female,  $1\frac{1}{2}$  line.

The *cephalothorax*, *falces*, *maxillæ*, *labium*, and *sternum* are darkish dull brown, slightly tinged with yellow, and with traces of a paler ill-defined longitudinal central band. The legs and palpi are yellow, and the abdomen a little paler than the cephalothorax, with a short, narrow, central, longitudinal stripe of a darker hue on the fore part.

The two central eyes of the long row in which the eight are disposed are larger than the one next to each, and are further from each other than each is from the next one to it; the eyes seated on each of the large tubercles at the extremities of the row are rather smaller than that next to each.

A single example was contained in the Amazons collection sent to me by Prof. Traill.

It is impossible to conjecture what size the adult form of this remarkable Spider may attain. Had it not been for the possession of three terminal tarsal claws, I should have concluded it to belong to the Thomisidæ. It seems to me impossible to include it in any at present recognized family. Wherever, however, it may be eventually placed, the genus is a very distinct one.

## EXPLANATION OF PLATE LXVI.

Fig. 1. *Thwaitesia margaritifera*, sp. n., p. 766.

*a*, Spider in profile, enlarged, without legs or palpi; *b*, eyes, from in front; *c*, maxillæ and labium; *d*, left palpus, from outer side; *e*, right palpus, from outer side; *f*, genital opening and process, from in front; *g*, ditto in profile; *h*, natural length of Spider.

2. *Eriauchenus workmanni*, sp. n., p. 768.

*a*, Spider in profile, enlarged, without legs or palpi; *b*, caput in profile, more enlarged; *c*, caput and falces, from in front; *d*, maxillæ, labium, and sternum; *e*, perspective view of caput and falces; *f*, Spider, of natural size.

3. *Arianthes attenuata*, sp. n., p. 770.

*a*, Spider, enlarged, in profile, with legs and palpus on one side only; *b*, right palpus, from outer side; *c*, caput in profile.

4. *Mutina furcifera*, sp. n., p. 771.

*a*, Spider enlarged; *b*, caput and falces, from in front; *c*, natural length and breadth of Spider.

5. *Bucranium taurifrons*, sp. n., p. 772.

*a*, Spider, enlarged; *b*, caput, still more enlarged, from above and behind; *c*, outline of Spider in profile, enlarged; *d*, caput and falces, from in front; *e*, maxillæ, labium, and sternum; *f*, natural length of Spider.

6. *Perissoblemma thomisiforme*, sp. n., p. 774.

*a*, Spider, enlarged; *b*, ditto, outline in profile; *c*, caput, falces, and eyes, from in front; *d*, caput and eyes, from above and behind; *e*, maxillæ and labium; *f*, posterior extremity of abdomen, from above, looking backwards, and showing the anal tubercle and transverse folds; *g*, natural length of Spider.

6. On the Generic Divisions of the Bucconidæ, together with the Description of a new Species of the Genus *Nonnula*.  
By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received June 17, 1881.]

As I now shortly hope to complete my Monograph of the Jacamars and Puff-birds by the issue of the sixth and seventh parts of that work, I beg leave to lay before the Society a summary of the generic divisions which I have adopted in the latter family. It will be noticed that I have made as few changes as possible in the nomenclature generally used, although I have now found it necessary to distinguish two aberrant and little-known species by new generic names.

In my 'Synopsis of the Bucconidæ,' published twenty-seven years ago, I divided the family into four genera, as follows:—

1. <i>Bucco</i> , Linn., with	15 species.
2. <i>Malacoptila</i> , G. R. Gray, with	12 „
3. <i>Monasa</i> , Vieill., with	4 „
4. <i>Chelidoptera</i> , Gould, with	2 „

Total 33 species.

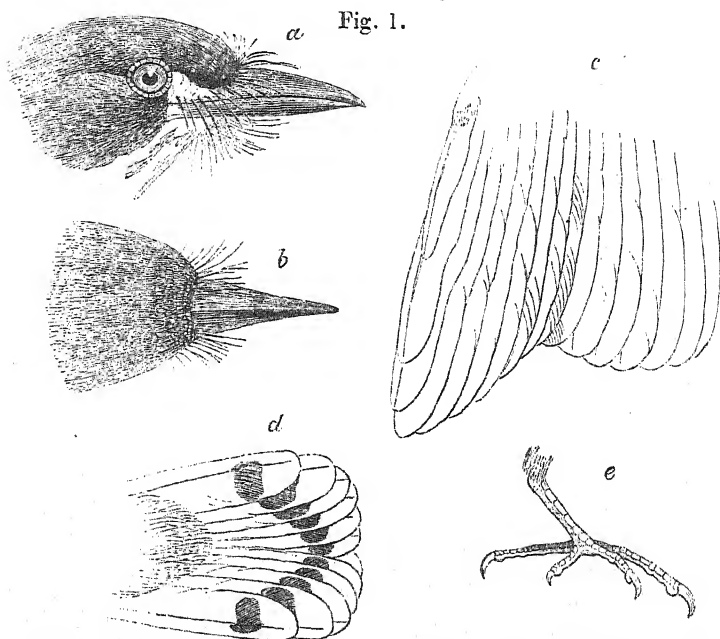
In the new illustrated Monograph of the group, which I am now bringing to a completion, the following arrangement of the family into genera has been adopted:—

1. <i>Bucco</i> , Linn. ....	20 species.
2. <i>Malacoptila</i> , G. R. Gray .....	7 „
3. <i>Micromonacha</i> , gen. nov. ....	1 „
4. <i>Nonnula</i> , Scl. ....	4 „
5. <i>Haploptila</i> , gen. nov. ....	1 „
6. <i>Monacha</i> , Vieill. ....	7 „
7. <i>Chelidoptera</i> , Gould .....	2 „

Total 42 species.

It will thus be seen that in the present work the genera have been increased from 4 to 7, and the species from 33 to 42<sup>1</sup>.

I append short distinctive characters of the two new genera, and of a new species of the genus *Nonnula*, from an example in the British Museum, which Dr. Günther kindly allows me to make known.



*Micromonacha lanceolata*. a. Bill, from side; b. Bill, from above; c. Wing-end, from within; d. Tail-end, from above; e. Foot.

<sup>1</sup> It may be noted that Messrs. Cabanis and Heine, who published a revision of the *Bucconidae* in the 4th part of the 'Museum Heineanum' in 1862, have divided the family into 11 genera and recognized 50 species, namely:—

1. <i>Chelidoptera</i> ..	3 species.	7. <i>Chaunornis</i> ..	2 species.
2. <i>Monasa</i> .....	6 „	8. <i>Nothriscus</i> ..	3 „
3. <i>Nonnula</i> .....	3 „	9. <i>Argicus</i> ....	1 „
4. <i>Malacoptila</i> ..	15 „	10. <i>Bucco</i> .....	1 „
5. <i>Nystalus</i> .....	6 „	11. <i>Notharchus</i> ..	8 „
6. <i>Hypnelus</i> .....	2 „		

I have therefore been able to make a slight consolidation both of genera and species

MICROMONACHA<sup>1</sup>, gen. nov.

*Genus generi Malacoptilæ affine, sed cauda brevior; necnon a genere Nonnula rostro brevior, ad basin magis incrassato, et digitis longioribus distinguendum.*

Sp. typ. *M. lanceolata* (*Bucco lanceolatus*, Deville).

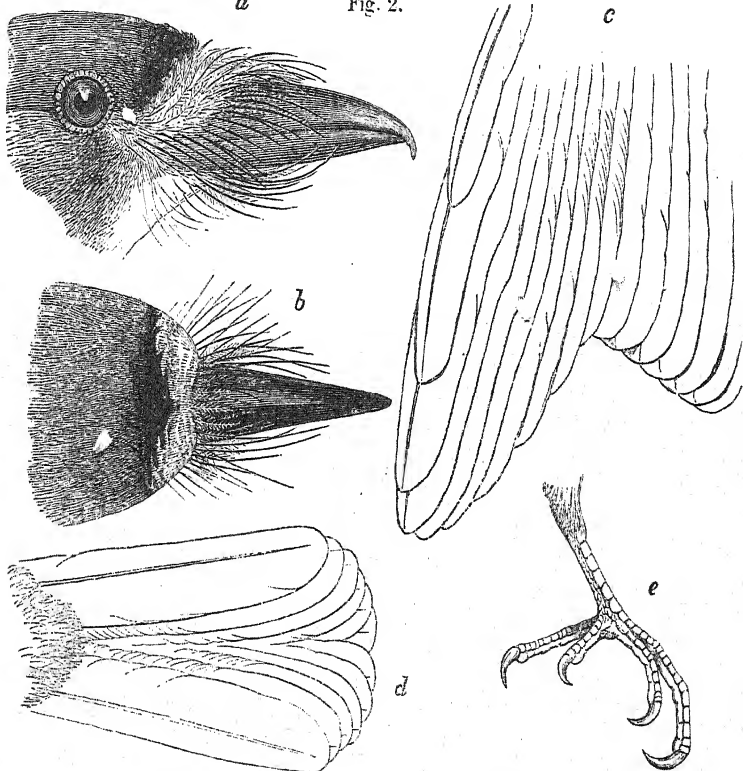
HAPALOPTILA<sup>2</sup>, gen. nov.

*Genus generi Monachæ<sup>3</sup> affine, sed rostro latiore, fortiter uncinato, setis omnino obsito, necnon cauda brevior distinguendum.*

Sp. typ. *H. castanea* (*Malacoptila castanea*, Verreaux).

I propose to give further comparative characters of these two new forms in the "Introduction" to my Monograph now in preparation

a Fig. 2.



*Hapalopectila castanea.* a. Bill, from side; b. Bill, from above; c. Wing-end, from within; d. Tail-end, from lower surface; e. Foot.

<sup>1</sup> μικρός, parvus, et μοναχή, monacha.

<sup>2</sup> ἀπαλός, tener, et πτερόν, penna.

<sup>3</sup> *Monasa* Vieillot, sed melius *Monacha* scribenda.

## NONNULA CINERACEA, sp. nov.

*Supra cineracea, dorso alis extus et cauda obscurioribus; loris et ciliis oculorum albis: subtus pallide fulva, ventre crissoque albis; subalaribus et remigum marginibus internis pallide cinnamomeis; rostro obscure plumbeo, ad basin flavicante; pedibus plumbeis. long tota 5.0, alæ 2.6, caudæ 2.1, rostro a rictu 1.0.*

*Hab.* Amazonia superior.

*Mus.* Brit.

*Obs.* Species *N. rubeculæ* proxima, sed colore dorsi cineraceo et pectoris valde dilutiore distinguenda.

The single specimen of this species is in the British Museum, where it is marked *Nonnula frontalis* in the handwriting of the late Mr. G. R. Gray. I do not, however, think that it can in any case be referred to that species. The skin in question was received from Mr. Bates through Mr. S. Stevens in 1853, and, as Mr. Bates kindly informs me, was one of a series obtained by him at Ega from a French collector who had been up the Rio Javari. It is labelled "iris châtain, bec bleu."

My specimen of *Brachygalba albigularis* (see Mon. Galb. et Bucc. p. 45) was procured by the same collector; and examples of *Bucco colaris* and *Malacoptila rufa* in Brit. Mus. are from the same source.

## 7. On the Conformation of the Thoracic End of the Trachea in the "Ratite" Birds. By W. A. FORBES, B.A., F.L.S., Prosector to the Society.

[Received June 21, 1881.]

In the present communication I propose to follow out the line of work developed by the late Prof. Garrod in his paper on the trachea of the Gallinæ<sup>1</sup>, by describing in detail the structure of the bifurcating trachea in the "Ratite" birds.

So far as I am aware, no proper description of this structure in the birds in question has ever been given, though the statement, apparently originally due to Meckel<sup>2</sup>, that in them "there is no lower larynx," has been very generally followed and copied, even in the latest text-books on the subject<sup>3</sup>. Prof. Owen has briefly described the bifurcating trachea in the Ostrich<sup>4</sup> and Apteryx<sup>5</sup>; and his accounts, as far as they go, are accurate enough. More recently E. Alix has very briefly mentioned some peculiarities of this part in the Rhea; and his account will be found quoted below.

<sup>1</sup> "On the Conformation of the Thoracic Extremity of the Trachea in the Class Aves. Part I. The Gallinæ," P. Z. S. 1879, pp. 354-380.

<sup>2</sup> 'Traité général d'Anatomie comparée,' x. p. 571, 1838.

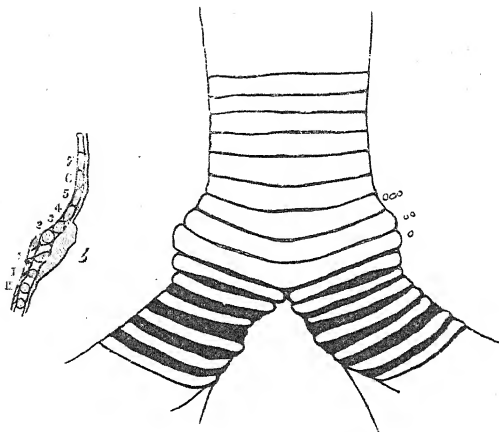
<sup>3</sup> Cf. Huxley's 'Anatomy of Vertebrates,' p. 313; Macalister, 'Morphology of Vertebrates,' p. 161.

<sup>4</sup> 'Catalogue of the Physiological Series of the Museum of the Royal College of Surgeons,' ii. p. 103, prep. 1159 (1834).

<sup>5</sup> Trans. Zool. Soc. ii. p. 279.

*Struthio camelus* (figs. 1, 2), on account of its size and simple structure, may be described here first. The trachea, inferior to the

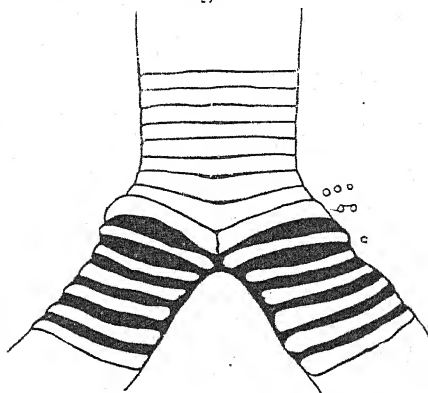
Fig. 1.

Bifurcating trachea of *Struthio camelus*, from before.

b. Section of wall of trachea, from behind, to show the vocal cord formed by the thickening of the mucous membrane of the interior. I. II., first two bronchial semirings. 1, 2, &c., last tracheal rings.

Here, and elsewhere in these figures, o indicates the last, oo the penultimate, ooo the antepenultimate tracheal rings.

Fig. 2.



The same, from behind. About natural size.

insertion of the *sterno-tracheales*, slightly narrows, having above the antepenultimate ring a diameter of about one inch. The tracheal

rings are here, as elsewhere, entire simple rings, of an average depth of about .15 inch, and are separated only by very slight interannular intervals. The trachea is slightly compressed and posteriorly carinated for about the last 7 rings. The last ring but four is somewhat produced downwards in the middle line, both anteriorly and posteriorly; it is, in consequence, narrower laterally than elsewhere. The antepenultimate ring presents the same features more strongly developed. In two of the four specimens examined it sends down a small pessuliform process of cartilage in the middle line behind, filling the chink left between the posterior extremities of the two next (incomplete) rings. The penultimate ring is narrower and more cylindrical than its predecessors; it is also wider transversely, and incomplete behind in the middle line, its extremities, however, being closely approximated to each other. The last tracheal ring is still wider transversely, and more cylindrical; and it too is incomplete posteriorly, to a greater extent than its predecessor; viewed from the side it is convex upwards, as are its few immediate predecessors in a less degree. The interannular intervals between all these rings are, when undisturbed, mere chinks filled up by dense fibrous and elastic tissues. There is no trace of a pessulus, though the last tracheal ring is slightly produced downwards in front. The first bronchial semiring, on each side, is narrow and cylindrical, strongest anteriorly, and somewhat attenuated posteriorly. It is separated only by a narrow interval from the last tracheal ring. The second and third rings are similar, but are more slender and lengthy; they are convex *downwards*, but very slightly so; hence the interannular intervals are small here also. Their anterior ends are very slightly turned, impinging but to a small extent on the *membrana tympaniformis*, which completes the bronchial tubes internally, and, in consequence of the absence of any three-way piece, passes continuously from one bronchus to the other, so closing the tracheal tube inferiorly. The fourth, fifth, and succeeding bronchial rings are similar in character; but their ends, which tend to be dilated posteriorly, are successively more and more incurved to about the tenth. Nowhere are the bronchial rings complete.

There is, at most, only a trace of a *membrana semilunaris*, in the form of a very feeble, scarcely raised, antero-posteriorly directed fold of mucous membrane.

Internally, the mucous membrane of the interior is greatly thickened, forming a vocal cord, in the region of the last three tracheal rings and first two bronchial semirings (vide fig. 1, b).

There is no trace of any intrinsic voice-muscle; and the lateral tracheal muscles stop at the point of insertion of the *sterno-tracheales*.

The genus *Apteryx*, in the simplicity of the structure of its lower larynx, stands on the same level as *Struthio*. In *Apteryx mantelli* (figs. 3, 4) about the last dozen tracheal rings are quite simple in form, with narrow interannular intervals, and no anterior and posterior notching. The penultimate ring is produced slightly downwards, in a triangular way, both anteriorly and posteriorly. The last ring is also produced downwards anteriorly, but is incom-



Fig. 3.

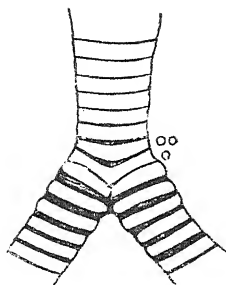
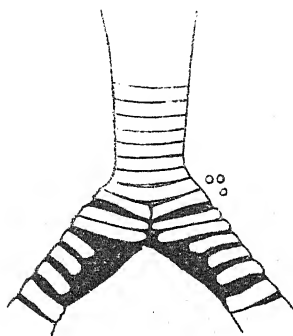
Bifurcating trachea of *Apteryx mantelli*, from before.

Fig. 4.



The same, from behind. About twice the natural size.

plete in the middle line behind; it is slightly wider and stronger than the preceding rings. The first two bronchial semirings on each side closely resemble it in form; the first semirings of opposite sides are almost in contact at both extremities, the next pair being more widely separated at those joints. There is only a narrow space between the last tracheal and the first bronchial ring. The succeeding bronchial semirings are perfectly simple, rather deep and stout pieces of cartilage, separated by narrow interannular spaces, and completed internally by a broad *membrana tympaniformis*; nowhere do they become complete circles. As in *Struthio*, there is no pessulus, and no intrinsic muscle. There is a slight antero-posteriorly directed vertical fold of mucous membrane between the two bronchial apertures internally, and also a feebly developed vocal cord on the external wall of the bronchi, where they diverge from the trachea. The lateral muscles stop some way before the end of the trachea, at the place where the *sterno-tracheales* are inserted. *Apteryx australis*, *A. haasti*, and *A. oweni* have all been

examined by me, and all agree closely in their tracheal structure with *A. mantelli*. My specimens of *A. australis* and *A. oweni* (two) agree together in having the last three tracheal rings incomplete posteriorly; whilst in *A. mantelli* and *A. hausti*, of which I have seen only single specimens, the last ring alone is incomplete.

In the *Casuariidae* we meet with peculiarities in the structure of the bifurcating trachea not existing in the other "Ratitæ." In *Casuarus galeatus* (figs. 5, 6, p. 783) the trachea is somewhat dilated for the terminal inch or so of its extent, transversely and also posteriorly. The last tracheal rings (for a number varying in different specimens, in the specimen in question 12, in another 23) are incomplete in the middle line behind, though the posterior ends are closely approximated together<sup>1</sup>.

These rings are tolerably uniform in breadth posteriorly, tapering only somewhat at their extremities; the interannular intervals are mere chinks. Anteriorly, however, the rings being dilated in the median line and attenuated laterally, the intervals are better developed. The last 5 or 6 rings are more and more curved downwards anteriorly, whilst their posterior moieties are somewhat dilated, their ends gradually receding more and more from each other in the middle line. There is no trace of a *pessulus*.

The first bronchial semirings much resemble the last tracheal rings, their anterior extremities being closely approximated together, and their posterior ones dilated, and somewhat pointed, terminally. The second, third, and fourth bronchial semirings are simple cartilaginous hoops, tolerably deep, separated only by narrow intervals, and, as usual, completed internally by a *membrana tympaniformis*. The fifth, sixth, and seventh are similar but longer semirings, the sixth and seventh being dilated anteriorly. The succeeding rings are similar but quite simple hoops, never forming anywhere complete circles.

There is no trace of any intrinsic muscles. The *sterno-tracheales* are inserted on the trachea at about the twelfth ring from the last. Anteriorly they expand on the tracheal wall, and are in contact with each other over the middle line, as is also the case in *Dromæus*, though not in the other three genera. A small part of each muscle runs to be inserted into the posterior wall of the trachea near the margin. The lateral muscle of the trachea passes between these two portions of the *sterno-trachealis* of its side, but does not pass down further than the commencement of the tracheal tympanum.

<sup>1</sup> Between the extremities of each imperfect tracheal ring runs a short band of connective and elastic tissue, with the fibres running transversely. These extend the whole length of the trachea, and when well developed have the appearance of a longitudinal band running along the middle line of the tube posteriorly. By the contraction of these fibres, the ends of the tracheal rings, where these are incomplete, or their more slender middle portions where perfect, are drawn together, and pressed into the interior of the tube, so forming what at first sight looks very much like a longitudinal, though incomplete, tracheal septum, such as is found in some *Procellariidae* and other birds. In consequence of this structure, a transverse section of the tracheal tympanum posteriorly presents two strong convexities separated by a median concavity.

Fig. 5.

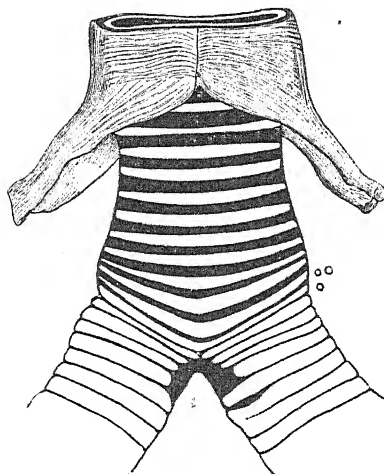
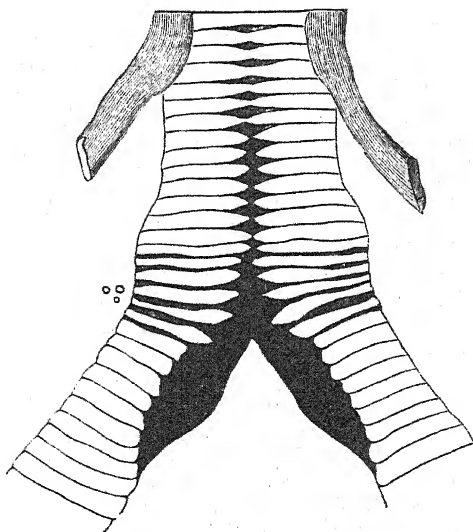
Bifurcating trachea of *Casuarinus galeatus*, from before.

Fig. 6.



The same, from behind. About natural size. The portion of the *sterno-tracheales* muscles at their insertion is represented in each figure.

As compared with *Struthio* and *Apteryx*, all the tracheal and bronchial rings are much less firm and more cartilaginous in *Casuaris*, as also in *Dromæus*.

The *membrana tympaniformis* completing the trachea below is a simple membrane, passing continuously from one bronchus to the other, with no intervening pessulus.

Internally, a very slight thickening of this membrane in an antero-posterior direction, at the bifurcation of the tube, may be seen; but there is nothing that can be properly called a *membrana semilunaris* present. The external vocal cord, on the other hand, situated over the first two bronchial semirings, is very well-developed, with a sharply-defined margin.

On the internal wall of the bronchus there is, in addition, a second, much slighter and less prominent fold, slightly concave forwards, running somewhat obliquely backwards and downwards, and supported by the anterior ends of the third and sixth bronchial semi-rings.

Besides *Casuaris galeatus*, I have examined tracheæ of *CC. beccarii*, *bennetti*, *uni-appendiculatus* (2 specimens), and *westermanni*; and in none of these species can I detect any difference of importance from the arrangement I have described above. In the last-named species (an adult specimen) there is a considerable amount of ossification in the last tracheal and first bronchial rings. The mucous fold on the internal walls of the bronchi varies much in development in different specimens. In adults there is a great accumulation of the fibrous and elastic tissues of the mucous membrane in the region of the tracheal tympanum.

Of *Dromæus novæ-hollandiæ* I have only, as yet, been able to examine one trachea, and that too from a young specimen. This closely resembles that of *Casuaris*; but the number of imperfect tracheal rings seems to be considerably smaller, in the specimen in question only the last three being incomplete behind. The third and fourth bronchial semirings are considerably stronger than the first two and the immediately preceding tracheal rings. There is no *pessulus*; but the *membrana semilunaris*, especially posteriorly, seems to be better developed.

The insertion of the *sterno-tracheales* is as in *Casuaris*. The lateral tracheal muscles extend down to within about 1.5 inch of the end of the trachea.

In the genus *Rhea* (as represented by *R. americana* and *R. macrorhyncha*) a very different condition of things occurs, there being a highly-specialized and peculiar syrinx, provided with a pair of intrinsic muscles<sup>1</sup>.

<sup>1</sup> I had observed the peculiar syrinx of *Rhea* some months before I met with M. Alix's short paper on this bird in the "Bulletin" of the Société Philomatique for 1874 (p. 38), in which he points out, for the first time, the fact that *Rhea* possesses a true syrinx. His account, which I here reproduce, runs as follows:—"Il y a chez le Nandou un larynx inférieur. Les cordes vocales sont placées à l'origine des bronches, dont les premiers anneaux sont incomplets, en sorte que la paroi interne qui leur correspond a l'aspect d'une membrane tympaniforme. Le reste des bronches est formé par des anneaux complets." This description is, as will be seen, very incomplete, and, in the last statement, incorrect.

In *Rhea americana* (figs. 7, 8) the average diameter of the trachea interiorly is about 1 inch, and it is somewhat compressed from before backwards. The cartilaginous tracheal rings are complete behind.

Fig. 7.

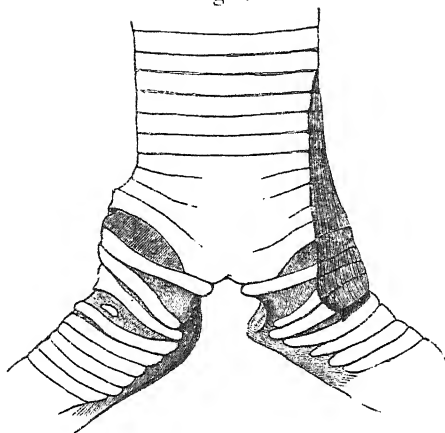
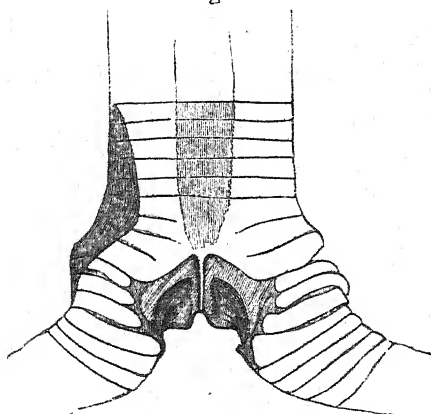
Bifurcating trachea of *Rhea americana*, from before.

Fig. 8.



The same, from behind. About the natural size. The intrinsic muscle has been removed on the right side. In fig. 8 the fibrous band running down the middle of the trachea posteriorly, as described above in *Casuarinus*, is also represented.

and closely approximated to each other. The last four tracheal rings are soldered together to form a cartilaginous box, the constituents of which are marked out by the interannular sutures, which are only interrupted in the middle line anteriorly and posteriorly.

The exact number of tracheal rings which are fused to form this box varies in different specimens from four to six; in some cases it is, apparently, formed by four rings on one side and five on another. The lowest tracheal ring is strongly concave downwards, but in front in the middle line is transversely truncated. Posteriorly the tympanic box is deeply and widely notched. There is a distinct, narrow, cartilaginous *pessulus*, which runs from behind forwards, connecting the anterior and posterior walls of this box, and interrupting, in the mid line, the continuity of the *membrana tympaniformis*, which completes the bronchial walls internally.

The first bronchial semiring is nearly straight, and of cylindrical form. It is closely connected at its extremities with the last tracheal ring; but between these points is a pretty wide, lunate, interannular interval. The anterior ends of these first semirings are intumed considerably, but do not meet each other, or the *pessulus*; posteriorly they do not extend inwards, by some way, as far as the preceding or succeeding rings. The second bronchial semiring is similar in form, but dilated slightly behind; it is closely approximated to the preceding ring in the greater part of its extent, but is anteriorly strongly curved downwards (in a somewhat sinuous way), so that here a considerable space is left between the two semirings in question. The third and fourth rings are considerably dilated, and produced inwards, posteriorly; anteriorly, in the particular specimen figured, they are fused into a comparatively narrow ring. The fifth, sixth, and succeeding semirings are quite simple incomplete hoops of cartilage, which become smaller and less complete internally as they approach the lungs.

Between the *pessulus* in the middle line and the tracheal box and first four bronchial semirings, is spread a membrane, completing the tracheal and bronchial walls at the bifurcation of the tube. This *membrana tympaniformis* is thinnest posteriorly; but in the middle part of its extent, over a triangular area—the base of the triangle resting on the *pessulus*, whilst the apex is at the posterior end of the fourth bronchial semiring—it is thickened and of a fibro-cartilaginous consistency.

From the sides of about the last ten tracheal rings a single thin but broad band of muscle arises, the fibres of which, running downwards and forwards, are inserted into the anterior halves of the first five bronchial semirings and the membranes between them, extending, in some specimens, almost to the anterior tips of the first two semirings. This muscle is therefore in all respects a true intrinsic syringeal one. The lateral tracheal muscle stops anteriorly to the origin of the intrinsic one.

Internally, there is a well-marked, sharp-bordered *membrana semilunaris*, resting on the *pessulus*, developed between the bronchi. In the space corresponding to the interval between the last tracheal and first bronchial rings, an accumulation of the fibrous and elastic tissues of the living membrane of the bronchus gives rise to a well-developed vocal cord.

*Rhea macrorhyncha* closely resembles, in all respects, *R. americana*

in the structure of its syrinx. In the single specimen I have by me, the tympanic box is anteriorly marked by four sutures on one side, and by three only on the other, as sometimes happens in *R. americana* (as, e. g., in the specimen described and figured above).

Reviewing the facts herein detailed, the most striking fact that comes out is the great difference exhibited by *Rhea* when compared with the four other genera described. In the possession of a tracheal box formed by the fusion of the few last tracheal rings, in the greater amount of specialization of the first two bronchial semirings of each side, in the presence of distinct interannular membrane-covered fenestræ, in the development of a well-marked cartilaginous *pessulus*, and in the possession of a pair of true intrinsic syringeal muscles running from the trachea to the bronchial semirings *Rhea* stands out by itself as sharply opposed to all the remaining "Ratite" birds. Of the latter, *Struthio* and *Apteryx*, as far as regards tracheal structure, form one group, the *Casuariidæ* another, the difference between the two being, however, comparatively slight as compared with those between them generally and *Rhea*.

*Struthio* and *Apteryx*, in the tendency of the trachea to narrow before its bifurcation, in the greater amount of solidity of the cartilaginous structures, in the more sharply-defined junction between the two constituent parts of the bifurcating trachea, owing to the better development of the few last tracheal rings, differ from the *Casuariidæ*, where the terminal part of the trachea tends to develop into an expanded *tympanum*, the cartilaginous structures are softer and more pliant, the terminal tracheal rings are narrower and tend, especially in *Casuarius*, to become imperfect posteriorly, and the junction of trachea and bronchi is less marked. In the *Casuariidæ*, too, the insertion of the *sterno-tracheales* is different from that of the other genera.

As regards the alleged absence of a lower larynx (or "syrinx") in these "Ratite" birds, it is obviously untrue as regards the genus *Rhea*. In the other genera, an answer is less easy, and its nature must depend upon what is meant by the term "lower larynx."

The presence of intrinsic voice-muscles cannot be regarded as essential in the definition of that term, any more than the development of a *pessulus*; indeed either or both (e. g. *Conopophaga*) may be absent in birds with well-developed vocal organs. If the presence of semirings externally, and of a *membrana tympaniformis* internally, forming the walls of the bronchi, and of vocal cords developed in the interior of those tubes, be held to be sufficient to characterize a "syrinx," then it will be incorrect to say that the Ratite birds have no voice-organs<sup>1</sup>. As I have here shown, all these three structures are

<sup>1</sup> It is sometimes, though most erroneously, supposed that because a bird has no intrinsic voice-muscles, it is, therefore, mute. Were such the case, all the Gallinæ, Ducks, *Chauna*, and many other noisy birds should be voiceless. As regards the Ratitæ, the statement made by Meckel that they are mute or nearly so (*l. c.* p. 571), is, I believe, equally groundless. I am assured by Mr. Bartlett that all, except perhaps the *Apteryx*, have the power of making considerable noises. As regards the Ostrich, indeed, Livingstone states that it is frequently difficult to distinguish its bellowing from the roaring of the Lion.

present, variously developed, in the genera in question, together with at least a rudiment of a *membrana semilunaris*. If a bird existed with its tracheal rings in no way modified at the bifurcation, with the bronchi, in their course thence forward to the lungs, completely encircled by tracheiform rings of simple form, and with no vocal cords or semilunar membrane, it might be said with truth that in such a form "there is no lower larynx." But, so far as I know, no existing bird possesses so simple an arrangement, though some of the Cathartidæ approach such a type very nearly.

8. On some Flycatchers lately added to the Collection of the British Museum. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Department of Zoology, British Museum.

[Received June 17, 1881.]

(Plate LXVII.)

The acquisition of the Gould collection has naturally added a large number of skins to the national collection; and it has increased our series of Flycatchers considerably, so that I am enabled to correct some errors which have crept into the Catalogue of Birds.

Genus ZEOCEPHUS, Bp.

(Cf. Sharpe, Cat. B. vol. iv. p. 343.)

I have now for the first time seen the adult male of *Zeocephus rufus*; and I find it to be a long-tailed bird, resembling a *Terpsiphone*; and it is doubtful now whether *Zeocephus* can be separated as a genus from the above-named one. The male of *Zeocephus rufus* is similar to the bird described by me (*l.c.*), which must have been a female, but differs in its richer chestnut plumage and in its elongated central tail-feathers, which measure 7 inches in length.

TERPSIPHONE SMITHII (Fraser).

*Muscipeta smithii*, Fraser, P. Z. S. 1843, p. 34; Allen and Thomps. Exped. Niger, ii. p. 492.

*Tchitrea smithii*, Hartl. Orn. West-Afr. p. 91; Cass. Pr. Philad. Acad. 1859, p. 42; Hartl. J. f. O. 1861, p. 168; Gray, Hand-l. B. i. p. 333, no. 5018.

*Terpsiphone smithii*, Finsch and Hartl. Vög. Ostaf. p. 312, note.

The type of this species is in the Gould collection; and I was surprised to find what a good species it really is, and how different from *T. rufiventris*, with which I had united it. In fact it comes nearest to *T. tricolor*, from which it differs in its rufous back.

MALURUS CYANOCHLAMYS, sp. n.

*Malurus cyaneus*, Sharpe, Cat. B. iv. p. 286 (nec Ellis).

Adult male. Similar to *M. cyaneus* of New South Wales, and, like that species, having the head, ear-coverts, and mantle of the same



tint, but the blue much lighter, pale, and of a silvery cobalt, instead of the deep cobalt-blue of *M. cyaneus*. The mantle is also smaller and more circumscribed.

*Hab.* Moreton Bay (*F. Strange*). Gould Coll.

*RHIPIDURA MACGILLIVRAYI*, sp. n. (Plate LXVII.)

*Adult male.* General colour above brown, the head dull ashy grey; least wing-coverts like the back; median and greater coverts dusky brown, tipped with white, forming a double band across the wing; primary-coverts and quills dusky brown, the secondaries externally margined with fulvous, the innermost with white; upper tail-coverts blackish; tail-feathers blackish, all but the centre ones with white shafts and very narrowly tipped with ashy whitish, which extends a little way down the end of the inner webs in the outermost feathers, the last tail-feather being whitish on the outer web, brown towards the end; lores dusky blackish; ear-coverts and feathers below the eye ashy brown; above the lores a spot of dull white, and changing to ochreous buff above the eye; chin and fore part of cheeks dull white, the hinder cheeks ochraceous buff like the under surface of the body, becoming deeper on the thighs and lighter on the under tail-coverts; under wing-coverts and axillaries ochraceous buff; quills dusky brown below, light ashy along the edge of the inner web. Total length 6·2 inches, culmen 0·45, wing 2·9, tail 3·5, tarsus 0·7.

*Adult female.* Similar to the male in colour. Total length 6·2 inches, culmen 0·5, wing 2·7, tail 3·4, tarsus 0·7.

*Hab.* Lord Howe's Island, Sept. 13, 1853 (*J. Macgillivray*). Gould collection.

Examples of this Flycatcher were found in a box of birds collected during the voyage of H.M.S. 'Herald' which contained several other rarities from Lord Howe's Island. The present species (which I dedicate to the memory of John Macgillivray, who collected the specimens) is a very distinct one, differing at once from *R. albiscapa* and the other allied species by the conspicuous ochreous-buff spot above the eye, this being white in the other *Rhipidura* enumerated by me (*l. c.*).

*SIPHIA OBSCURA*, sp. n.

*Adult.* General colour above olive greenish, inclining to lighter olive on the rump and upper tail-coverts; quills light olive-brown, edged with the same brighter olive as the rump; wing-coverts dark olive-green like the back; quills dusky brown, externally olive-green, the primaries edged with brighter olive; crown dark slaty grey, with a slight wash of olive-green; lores dusky blackish, surmounted by a white streak from above the ear-coverts to the base of the bill; ear-coverts dusky ash-brown with whitish shaft-lines; cheeks and under surface of body isabelline-brown, a little whiter on the throat and centre of the breast; thighs deeper and more tawny; under wing-coverts and axillaries olive, the latter with a tinge of brighter olive-yellow; quills dusky brown below, fulvescent along the edge of the

inner web. Total length 5 inches, culmen 0·55, wing 2·4, tail 2·25, tarsus 0·9.

*Hab.* Borneo. Gould collection.

After comparing this dull-coloured Flycatcher with examples of several genera of Muscicapidæ, I have come to the conclusion that it is a *Siphia* belonging to the olive section (cf. Sharpe, Cat. B. iv. p. 443), but differing from all the species by its olive tail, grey cap, and white eyebrow.

9. On the Birds of Sandakan, North-east Borneo. By  
R. BOWDLER SHARPE, F.L.S., F.Z.S., Department of  
Zoology, British Museum.

[Received June 21, 1881.]

My friend Mr. W. B. Pryer some time ago forwarded to me three large collections which he had made in the new district of Sandakan in North-eastern Borneo; and a list of the species represented in them is here given. Unfortunately only one species appears to be actually new to science; but several birds unknown to the avifauna of Borneo are recorded, and a few remarks on some of the rarer species are added. Owing to many calls upon my time, I have had no opportunity before of describing Mr. Pryer's collections, for which I owe him an apology.

In the present paper, I have quoted Count Salvadori's '*Uccelli di Borneo*,' both as regards nomenclature and classification, departing therefrom in only a very few instances.

1. *FALCO COMMUNIS*, Gm.

*Falco communis*, Sharpe, Cat. B. i. p. 376; Salvad. Ucc. Born. p. 1.

A young male. I also saw, a few years ago, a fine adult Peregrine in the Marquis of Tweeddale's collection, which had been sold to him by a dealer as from North-eastern Borneo. Hitherto the occurrence of the Peregrine Falcon in Borneo has rested upon a specimen procured by the late Mr. Motley at Banjermassing.

2. *MICROHIERAX LATIFRONS*.

*Microhierax latifrons*, Sharpe, Ibis, 1879, p. 237, pl. vii.

One specimen with the broad white forehead characteristic of the species. Without in the least doubting Mr. Whitely's good faith in his correspondent who sent him two specimens of this species said to be from the Nicobars (cf. Gurney, Ibis, 1881, p. 274), I greatly doubt the possibility of such a bird having escaped all the researches of such naturalists as Mr. Davison and Capt. Wimberley, who have resided for a long time in these islands and thoroughly worked their ornithology. As is well known, the members of the genus *Microhierax* are very restricted in their range; and it is scarcely possible that *M. latifrons* should inhabit N.W. Borneo and the Nicobars, with the Malayan peninsula and its species *M. fringillarius* interposed.

## 3. SPILORNIS PALLIDUS, Walden.

*Spilornis pallidus*, Sharpe, Cat. B. i. p. 290.

*Spilornis bacha* (Daud.), Salvad. t. c. p. 7.

In the first collection was a female with remains of the young plumage about the head; in the third collection an adult male.

## 4. PERNIS PTILONORHYNCHUS (Temm.)

*Pernis ptilonorhynchus*, Salvad. t. c. p. 9; Sharpe, Cat. B. i. p. 347.

This species of Honey-Buzzard was discovered by Doria and Beccari near Sarawak, and at the time of writing my Catalogue was not known as an inhabitant of Borneo. Three specimens have been sent by Mr. Pryer from Sandakan; and I am by no means certain that the Honey-Kite from the Indo-Malayan islands is not a different species from the bird inhabiting the Indian Peninsula; but no doubt a large series would be required for comparison.

## 5. HALIASTUR INTERMEDIUS, Gurney.

*Haliastur intermedius*, Sharpe, Cat. B. i. p. 314.

*H. indus* (Bodd.), Salvad. t. c. p. 12.

An adult specimen.

## 6. SPIZAETUS LIMNAETUS (Horsf.)

*Spizaetus limnaetus*, Salvad. t. c. p. 15.

An adult bird in the uniform dark-brown stage usually met with in Borneo.

## 7. KETUPA KETUPA (Horsf.)

*Ketupa javanensis*, Less.; Salvad. Ucc. Born. p. 20; Sharpe, Cat. B. ii. p. 8.

Two specimens, both adult.

## 8. NINOX SCUTULATA (Raffl.)

*Ninox scutulata*, Sharpe, Cat. B. ii. p. 156.

*Ninox borneensis*, Bp., Salvad. t. c. p. 18.

A single adult specimen.

## 9. SCOPS LEMPIJI (Horsf.)

*Scops lempiji*, Sharpe, Cat. B. ii. p. 91; Salvad. t. c. p. 19.

## 10. LORICULUS GALGULUS (L.)

*Loriculus galgulus*, Salvad. t. c. p. 26.

An adult bird.

## 11. HARPACTES DIARDI (Temm.)

*Pyrotrogon diardi*, Salvad. t. c. p. 28.

## 12. HARPACTES KASUMBA (Raffl.)

*Pyrotrogon kasumba*, Salvad. t. c. p. 29.

13. *HARPACTES DUVAUCELI* (Temm.).  
*Pyrotrogon duvauceli*, Salvad. *t. c.* p. 29.
14. *XANTHOLEMA DUVAUCELI* (Less.).  
*Xantholema duvauceli*, Salvad. *t. c.* p. 38. .
15. *CALORHAMPHUS FULIGINOSUS* (Temm.).  
*Calorhamphus fuliginosus*, Salvad. *t. c.* p. 39.
16. *IYNGOPICUS AURANTIIVENTRIS*, Salvad.  
*Jyngipicus aurantiiventris*, Salvad. *t. c.* p. 11, tav. iv. fig. 2.
17. *XYLOLEPES VALIDUS* (Temm.).  
*Xylolepes validus*, Salvad. *t. c.* p. 43.
18. *CALLOLOPHUS PUNICEUS* (Horsf.).  
*Callolophus puniceus*, Salvad. *t. c.* p. 49.
19. *ALOPHONERPES PULVERULENTUS* (Temm.).  
*Alophonerpes pulverulentus*, Salvad. *t. c.* p. 51.
20. *THRIPONAX JAVENSIS* (Horsf.).  
*Thriponax javensis*, Salvad. *t. c.* p. 52.
21. *TIGA JAVANENSIS* (Ljung.).  
*Tiga javanensis*, Salvad. *t. c.* p. 54.
22. *MEIGLYPTES TRISTIS* (Horsf.).  
*Meiglyptes tristis*, Salvad. *t. c.* p. 56.
23. *MEIGLYPTES TUKKI* (Less.).  
*Meiglyptes tukki*, Salvad. *t. c.* p. 57.
24. *MICROPTERNUS BADIUS* (Temm.).  
*Micropternus badius*, Salvad. *t. c.* p. 58.
25. *CHRYSOCOCYX XANTHORHYNCHUS* (Horsf.).  
*Chrysococcyx xanthorhynchus*, Salvad. *t. c.* p. 62.  
A young specimen in a very interesting stage of plumage, being white banded with brown below, the head uniform light rufous, the back also pale rufous with green bands, here and there a purple feather appearing and distinguishing the species.
26. *SURNICULUS LUGUBRIS* (Horsf.).  
*Surniculus lugubris*, Salvad. *t. c.* p. 63.
27. *CACOMANTIS MERULINUS* (Scop.).  
*Cacomantis merulinus*, Salvad. *t. c.* p. 64.
28. *RHYNORTHA CHLOROPHÆA* (Raffl.).  
*Rhynortha chlorophæa*, Salvad. *t. c.* p. 69.
29. *RHOPODYTES BORNEENSIS*.  
*Rhopodytes borneensis*, Salvad. *t. c.* p. 72.

30. RHOPODYTES ERYTHROGNATHUS (Hartl.),  
*Rhopodytes erythrognathus*, Sharpe, P. Z. S. 1873, p. 604.

31. ZANCLOSTOMUS JAVANICUS (Horsf.).  
*Zanclostomus javanicus*, Salvad. t. c. p. 75.

32. CENTROCOCCYX EURYCERCUS (Hay).  
*Centrococcyx eurycercus*, Salvad. t. c. p. 78.

33. ANORRHINUS GALERITUS (Temm.).  
*Anorrhinus galeritus*, Salvad. t. c. p. 70.

34. MEROPS SUMATRANUS, Raffl.  
*Merops bicolor*, Salvad. t. c. p. 90 (nec Bodd.).

35. NYCTIORNIS AMICTA (Temm.).  
*Nyctiornis amicta*, Salvad. t. c. p. 91.

Among the specimens sent is a young one in the green stage of plumage, with a slight indication of the lilac frontal plumes appearing, and on the breast some red feathers, which, however, appear to be more orange-red than scarlet, as in the fully adult birds.

36. PELARGOPSIS LEUCOCEPHALA (Bodd.).  
*Pelargopsis leucocephala*, Salvad. t. c. p. 95.

37. CEYX DILLWYNNI, Sharpe.  
*Ceyx dillwynni*, Salvad. t. c. p. 99.

Three perfectly adult specimens with the characteristic scapulars of the species.

38. HALCYON COROMANDA (Lath.).  
*Callialcyon coromanda* (Lath.); Salvad. t. c. p. 101.

39. HALCYON CONCRETA (Temm.).  
*Caridagrus concretus* (Temm.), Salvad. t. c. p. 102.  
Two adult specimens.

40. HALCYON CHLORIS (Bodd.).  
*Sauropatis chloris* (Bodd.), Salvad. t. c. p. 103.

41. CARCINEUTES MELANOPS (Temm.).  
*Lacedo melanops* (Temm.), Salvad. t. c. p. 104.

A beautiful adult specimen, with the black collar round the hind neck perfectly developed.

42. EURYSTOMUS ORIENTALIS, L.  
*Eurystomus orientalis*, Salvad. t. c. p. 105.

43. COLLOCALIA LINCHI, Horsf. & Moore.  
*Collocalia linchi*, Salvad. t. c. p. 121.

## 44. GERYGONE SULFUREA, Wall.

*Gerygone sulfurea*, Sharpe, Cat. B. iv. p. 214.

I have compared the single specimen sent by Mr. Pryer with the type of *G. sulfurea*, and find that it agrees better with this species than with *G. flaveola*, though the latter bird is also said to inhabit Borneo. In the Gould collection also was a specimen of the present bird, marked as being from the "Philippines."

## 45. SIPHIA BANYUMAS (Horsf.).

*Siphia banyumas*, Sharpe, Cat. B. iv. p. 449.

*Cyornis banyumas* (Horsf.), Salvad. t. c. p. 130.

Adult male, female, and young.

## 46. HYPOTHYMIS OCCIPITALIS (Vig.).

*Hypothymis occipitalis*, Sharpe, Cat. B. iv. p. 275.

*Hypothymis azurea*, Salvad. t. c. p. 133 (nec Bodd.).

## 47. RHIPIDURA JAVANICA (Sparrm.).

*Rhipidura javanica*, Sharpe, Cat. B. iv. p. 332.

*Leucocerca javanica* (Sparrm.), Salvad. t. c. p. 135.

## 48. RHIPIDURA PERLATA (Müll.).

*Rhipidura perlata*, Sharpe, t. c. p. 328.

*Leucocerca perlata* (Müll.), Salvad. t. c. p. 136.

## 49. TERPSIPHONE AFFINIS (Hay).

*Terpsiphone affinis*, Salvad. t. c. p. 137.

## 50. PHILENTOMA VELATUM (Temm.).

*Philentoma velatum*, Salvad. t. c. p. 132; Sharpe, Cat. B. iv. p. 365.

## 51. PHILENTOMA PYRRHOPTERUM (Temm.).

*Philentoma pyrrhopterum*, Salvad. t. c. p. 138; Sharpe, t. c. p. 366.

## 52. RHINOMYIAS PECTORALIS (Salvad.).

*Rhinomyias pectoralis*, Sharpe, Cat. B. iv. p. 368.

*Setaria pectoralis*, Salvad. t. c. p. 233, tav. iv. fig. 1.

## 53. ARTAMUS LEUCORHYNCHUS (L.).

*Artamus leucorhynchus*, Salvad. t. c. p. 140.

## 54. PERICROCOTUS IGNEUS, Blyth.

*Pericrocotus igneus*, Salvad. t. c. p. 144.

## 55. LALAGE TERAT (Bodd.).

*Lalage terat*, Salvad. t. c. p. 145.

## 56. LALAGE CULMINATA (A. Hay).

*Lalage culminata*, Sharpe, Cat. B. iv. p. 104.

*Volvocivora schierbrandii*, Pelz., Salvad. t. c. p. 149.

## 57. HEMIPUS OBSCURUS (Horsf.).

*Hemipus obscurus*, Sharpe, Cat. B. iii. p. 305.*Myiolestes obscurus* (Horsf.), Salvad. t. c. p. 156.

## 58. IRENA CRINIGERA.

*Irena crinigera*, Sharpe, Cat. B. iii. p. 267; Gould, B. Asia, pt. xxxii.*Irena cyanea*, Salvad. t. c. p. 151 (nec Begbie).

Adult males and females.

## 59. DISSEMURUS BRACHYPHORUS (Temm.).

*Dissemurus brachyphorus*, Salvad. t. c. p. 154.

## 60. TEPHRODORNIS GULARIS (Raffl.).

*Tephrodornis gularis*, Salvad. t. c. p. 156.

61. LANIUS CEPHALOMELAS, Bp. Rev. et Mag. de Zool. 1853, p. 436; Walden, Ibis, 1868, p. 70.

*Lanius bentet*, Horsf., Salvad. t. c. p. 158.*L. similis* *L. bentet*, sed capite nuchaque nigris pileum formantibus, interscapulio et dorso superiore clare cineraceis distinguendus.

Long. tot. 9, culm. 0·8, alæ 3·52, caudæ 5·1, tarsi 1·05.

Mr. Pryer has sent a specimen of this Shrike, which agrees with one from Sandakan already in the British Museum. These in turn agree with Philippine examples, and seem to belong to a distinct race of *L. bentet*.

## 62. PITYRIASIS GYMNOCEPHALA (Raffl.).

*Pityriasis gymnocephala*, Salvad. t. c. p. 159.

## 63. DENDROPHILA FRONTALIS (Horsf.).

*Dendrophila frontalis*, Salvad. t. c. p. 161.

## 64. PRIONOCHILUS XANTHOPYGIUS, Salvad. t. c. p. 162.

## 65. PRIONOCHILUS THORACICUS (Temm.).

*Prionochilus thoracicus*, Salvad. t. c. p. 163.

A large series.

## 66. PRIONOCHILUS MACULATUS (Temm.).

*Prionochilus maculatus*, Salvad. t. c. p. 164.

## 67. DICEUM PRYERI, sp. n.

*D. simile* *D. nigrimento*, Salvad., sed gutture toto, colli et corporis lateribus nigris distinguendum. Long. tot. 2·9, culm. 0·4, alæ 1·85, caudæ 1·0, tarsi 0·45.

The first collection sent by Mr. Pryer contained a single specimen of this *Diceum*: it appeared to be quite different from *D. nigrimentum*, which is in the collection of the British Museum. Subsequently Mr. Pryer forwarded some more adult males in his second and third consignments; and as all of these agree in having the whole of the throat black, I have no doubt that it is a good species.

68. *DICÆUM TRIGONOSTIGMA* (Scop.).

*Dicæum trigonostigma*, Salvad. *t. c.* p. 166.

69. *ANTHREPTES HYPOGRAMMICA* (S. Müll.).

*Anthreptes hypogrammica*, Shelley, Monogr. Neet. p. 305, pl. xcviii.

*Hypogramma nuchalis* (Blyth), Salvad. *t. c.* p. 172.

70. *ÆTHOPYGA SIPARAJA* (Raffl.).

*Æthopyga siparaja*, Shelley, *t. c.* p. 57, pl. xix.

*Æthopyga eupogon*, Cab., Salvad. *t. c.* p. 173.

71. *CINNYRIS HASSELTII* (Temm.).

*Cinnyris hasseltii*, Shelley, *t. c.* p. 127, pl. xlii.

*Nectarophila hasseltii* (Temm.), Salvad. *t. c.* p. 177.

72. *CHALCOSTETHA INSIGNIS* (Jard.).

*Chalcostetha insignis*, Salvad. *t. c.* p. 177; Shelley, *t. c.* p. 87, pl. xxx.

73. *ANTHREPTES MALACCENSIS* (Scop.).

*Anthreptes malaccensis*, Salvad. *t. c.* p. 178; Shelley, *t. c.* p. 315, pl. ci. fig. 2, and pl. cii.

74. *ANTHREPTES PHŒNICOTIS* (Temm.).

*Anthreptes phœnicotis*, Shelley, *t. c.* p. 325, pl. cv.

*Chalcoparia singalensis* (Gm.), Salvad. *t. c.* p. 180.

75. *ARACHNORAPHIS FLAVIGASTRA* (Blyth).

*Arachnoraphis flavigastrea*, Shelley, *t. c.* p. 373, pl. cxx.

*Arachnothera eytonii*, Salvad. *t. c.* p. 182.

76. *ARACHNOTHERA LONGIROSTRA* (Lath.).

*Arachnothera longirostra*, Salvad. *t. c.* p. 186; Shelley, *t. c.* p. 357, pl. cxiv.

77. *ÆGITHINA VIRIDIS* (Bp.).

*Iora scapularis*, Horsf., Salvad. *t. c.* p. 190.

78. *CHLOROPSIS ZOSTEROPS*, Vig.

*Phyllornis sonneratii* (J. & S.), Salvad. *t. c.* p. 193.

79. *PYCNONOTUS ANALIS* (Horsf.).

*Pycnonotus analis*, Salvad. *t. c.* p. 197.

80. *PYCNONOTUS SIMPLEX* (Less.).

*Pycnonotus brunneus* and *P. modestus*, Blyth, J. A. S. Beng. xiv. p. 568.

*Microtarsus olivaceus*, Moore in Horsf. & Moore's Cat. B. E. I. Co. Mus. i. p. 249.

Four specimens sent by Mr. Pryer. Mr. Hume (Str. F. 1878, p. 309) has pointed out the differences between this species and *P. plumosus* of Blyth. He calls it *Ixos brunneus* (Blyth); but,



after a thorough study of the genus, I have no hesitation in considering it to be the true *P. simplex* of Lesson ; and this name should be restored to it.

81. *MICROPUS MELANOCEPHALUS* (Gm.).

*Brachypodius melanocephalus*, Salvad. *t. c.* p. 201.

By comparing the type of the genus *Micropus*, Swains. (Classif. B. ii. p. 226), which is *Micropus chalconcephalus*, with *Brachypodius melanocephalus*, which is the type of the genus *Brachypodius*, it will be found that they are generically the same ; and hence *Brachypodius* of Blyth (1845) is a synonym of *Micropus* of Swainson (1837).

82. *HEMIXUS MALACCENSIS* (Blyth).

*Hypsipetes malaccensis* (Blyth), Salvad. *t. c.* p. 202.

This species is not a true *Hypsipetes*, but a *Hemixus* with well-developed rectal bristles.

83. *TRICHOLESTES CRINIGER* (Blyth).

*Tricholestes minutus* (Hartl.), Salvad. *t. c.* p. 205, tav. v. fig. 1.

84. *CRINIGER GUTTURALIS* (S. Müll.).

*Criniger gutturalis*, Salvad. *t. c.* p. 206.

85. *CRINIGER PHŒOCEPHALUS* (Hartl.).

*Criniger phæocephalus*, Salvad. *t. c.* p. 207.

86. *IOLE OLIVACEA*, Blyth.

*Iole olivacea*, Salvad. *t. c.* p. 210.

Two adult specimens.

87. *CYANODERMA BICOLOR* (Blyth).

*Cyanoderma erythropterum* (Blyth), Salvad. *t. c.* p. 213.

88. *HERPORNIS BRUNNESCENS*, Sharpe, Ibis, 1879, p. 257.

89. *MACRONUS PTILOSUS*, J. & S.

*Macronus ptilosus*, Salvad. *t. c.* p. 216.

90. *DRYMOCATAPHUS CAPISTRATOIDES* (Temm.).

*Drymocataphus capistratoides*, Salvad. *t. c.* p. 218.

91. *BRACHYPTERYX UMBRATILIS* (Temm.).

*Brachypteryx umbratilis*, Salvad. *t. c.* p. 220.

92. *BRACHYPTERYX MALACCENSIS*, Hartl.

*Brachypteryx malaccensis*, Salvad. *t. c.* p. 222.

93. *KENOPIA STRIATA* (Blyth).

*Kenopia striata*, Salvad. *t. c.* p. 224, tav. v. fig. 2.

## 94. MALACOPTERON MAJUS, Blyth.

*Malacopteron majus*, Salvad. *t. c.* p. 225.

## 95. PITTA USSHERI, Sharpe.

*Pitta ussheri*, Sharpe, P. Z. S. 1879, p. 94; Gould, B. Asia, pt. xxix.

A beautiful specimen of this rare *Pitta*.

## 96. PITTA CÆRULEA (Raffl.).

*Pitta cærulea*, Gould, B. of Asia, pt. xxx.

New to Borneo. Four specimens. One male is marked by Mr. Pryer "Obtained at Upak, March 13, 1878. Eyes brown, black pupil; beak black; legs brown."

## 97. PITTA BAUDI, Müll. &amp; Schl.

*Pitta baudi*, Salvad. *t. c.* p. 243; Gould, B. Austr. pt. xxix.

## 98. PITTA MUELLERI (Bp.).

*Pitta muelleri*, Salvad. *t. c.* p. 240.

## 99. CALYPTOMENA VIRIDIS, Raffl.

*Calyptomena viridis*, Salvad. *t. c.* p. 106.

## 100. EURYLÆMUS OCHROMELAS, Raffl.

*Eurylæmus ochromelas*, Salvad. *t. c.* p. 108.

## 101. CYMBORHYNCHUS MACRORHYNCHUS (Gm.).

*Cymborhynchus macrorhynchus*, Salvad. *t. c.* p. 109.

## 102. ORTHOTOMUS CINERACEUS, Blyth.

## 103. ORTHOTOMUS RUFICEPS, Less.

*Orthotomus ruficeps*, Salvad. *t. c.* p. 248.

## 104. HENICURUS FRONTALIS, Blyth.

*Henicurus frontalis*, Elwes, Ibis, 1872, p. 259, pl. ix.; Salvad. *t. c.* p. 258.

## 105. CITTOCINCLA STRICKLANDI (Motl. &amp; Dillw.).

*Cittocincla stricklandi*, Salvad. *t. c.* p. 253.

## 106. COPSYPHUS AMÆNUS (Horsf.).

*Copsychus amœnus*, Salvad. *t. c.* p. 255.

## 107. ANTHUS GUSTAVI, Swinh.

*Anthus gustavi*, Sharpe, Ibis, 1879, p. 262.

## 108. MUNIA ATRICAPILLA (V.).

*Munia atricapilla*, Salvad. *t. c.* p. 265.

109. MUNIA LEUCOGASTRA (Blyth).  
*Munia leucogastra*, Salvad. *t. c.* p. 267.
110. CALORNIS CHALYBÆUS (Horsf.).  
*Calornis chalybæus*, Salvad. *t. c.* p. 271.
111. ORIOLUS XANTHONOTUS, Horsf.  
*Oriolus xanthonotus*, Salvad. *t. c.* p. 277.
112. PLATYSMURUS ATERRIMUS (Temmin.).  
*Platysmurus aterrimus*, Salvad. *t. c.* p. 279.
113. CORONE ENCA (Horsf.).  
*Corone enca*, Sharpe, Cat. B. iii. p. 43.  
*Corone validus*, Temmin., Salvad. *t. c.* p. 281.
114. PLATYLOPHUS CORONATUS (Raffl.).  
*Platylophus coronatus*, Salvad. *t. c.* p. 280.  
Two specimens agreeing with the Sumatran type.
115. TRERON VERNANS (L.).  
*Treron vernans*, Salvad. *t. c.* p. 286.
116. TRERON FULVICOLLIS (Wagl.).  
*Treron fulvicollis*, Salvad. *t. c.* p. 288.
117. PTILOPUS JAMBU (Gm.).  
*Ptilopus jambu*, Salvad. *t. c.* p. 289.
118. CARPOPHAGA ÆNEA (L.).  
*Carpophaga ænea*, Salvad. *t. c.* p. 290.
119. MYRISTICIVORA BICOLOR (Scop.).  
*Myristicivora bicolor*, Salvad. Ann. Mus. Civic. Genov. ix.  
p. 276.  
An adult specimen.
120. SPILOPELIA TIGRINA (Temmin.).  
*Spilopelia tigrina*, Salvad. *t. c.* p. 297.
121. TURTUR DUSSUMIERI (Temmin.).  
*Turtur dussumieri*, Bp. Consp. ii. p. 65; Wall. Ibis, 1865, p. 392.  
Count Salvadori includes in his work on the birds of Borneo only *Streptopelia bitorquata* (= *Turtur bitorquata*) with a query, the species being included in the Bornean list only on the authority of Gray. The specimens now sent by Mr. Pryer agree with Bonaparte's diagnosis of *T. dussumieri*, which must be added

to the avifauna of Borneo; and therefore Mr. Wallace's suggestion (*l. c.*) that Bonaparte had made an error in locality, is not borne out.

122. *MEGAPODIUS CUMINGI*, Dillw.

*Megapodius cumingi*, Salvad. *t. c.* p. 302.

123. *EUPLOCAMUS IGNITUS* (Lath.).

*Euplocamus nobilis*, Sclater, Salvad. *t. c.* p. 306.

124. *ROLLULUS ROULOUL* (Scop.).

*Rollulus rouloul*, Salvad. *t. c.* p. 308.

125. *SQUATAROLA HELVETICA* (L.).

*Squatarola helvetica*, Salvad. *t. c.* p. 313.

126. *ÆGIALITIS GEOFFROYI* (Wagl.).

*Ægialitis geoffroyi*, Salvad. *t. c.* p. 318.

127. *TRINGOIDES HYPOLEUCUS* (L.).

*Tringoides hypoleucus*, Salvad. *t. c.* p. 326.

128. *NUMENIUS UROPYGIALIS*, Gould.

*Numenius phæopus* (L.), Salvad. *t. c.* p. 333.

129. *ERYTHRA PHÆNICURA* (Penn.).

*Erythra phænicura*, Salvad. *t. c.* p. 340.

130. *ARDEA SUMATRANA*, Raffl.

*Ardea sumatrana*, Salvad. *t. c.* p. 344.

131. *BUTORIDES JAVANICA* (Horsf.).

*Butorides javanica*, Salvad. *t. c.* p. 351.

132. *BUBULCUS COROMANDUS* (Bodd.).

*Bubulcus coromandus*, Salvad. *t. c.* p. 340.

133. *SULA FIBER* (L.).

*Sula fiber*, Salvad. *t. c.* p. 369.

A young and a fully adult bird. This species has never been before recorded from Borneo, though Count Salvadori (*l. c.*) foretold its occurrence. I fully suspect that the young birds recorded by me ('Ibis,' 1879, p. 272) from the Lawas river and Sandakan really belonged to this species, and not to *S. piscatrix*, to which I referred them.

134. *PUFFINUS LEUCOMELAS*, T. & S.

10. On the Land-Shells of the Island of Socotra collected by Prof. I. Bayley Balfour. By Lieut.-Colonel H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c.—Part II. Helicaceæ<sup>1</sup>.

(Plates LXVIII., LXIX.)

The most abundant Pulmoniferous shells on the island of Socotra are those of a subgenus of *Buliminus*, which Mr. Geoffrey Nevill separated and distinguished under the title *Achatinelloides*, upon the then only known species *B. socotrensis* of Pfeiffer, one of the most distinct forms of the group. *Achatinelloides* (which I propose for the present to restrict to species of this island until we possess a larger series of the land-shells of the adjacent mainland, almost unknown at present) may be divided into two well-marked divisions:—*a*, with well costulated sculpture; *b*, smooth and polished. A broad, rather flat columellar margin, more or less plicate, is characteristic of the subgenus, and is well shown in the type (vide fig. 1 *a*, Plate LXVIII.). There is a third group of *Bulimini* peculiar to Socotra, *c*, characterized by their thin fragile shells, while the columellar margin still assimilates to that of the more solid shells of the first group (compare fig. 5 *a*, Plate LXVIII., with fig. 9 *a*, Plate LXIX.). As yet we know nothing of their anatomy; but as they approach in form and coloration *B. velutinus*, Pfr., which is the type of Albers's subgenus *Pachnodus*, I have placed them in that subgenus for the present.

Groups *a* and *b* show, in a very interesting manner, how gradually species have been modified, and yet how close they remain as a whole. Take, for instance, the markings in *A. socotrensis* and *socotrensis* var. *elongatus*, and observe how the spiral markings in the former have become longitudinal on the sides of the longer whorls of the latter, and how these last again have been modified in *A. tigris* into still more pronounced longitudinal rays of colour, while the shell has changed into the more elongate form and lost its ribbed sculpture. Again, in *A. zebrinus* we have another modification of the same spiral bands seen in *A. socotrensis*, but in a still more solid glossy shell. In *A. balfouri*, in the first 4 or 5 whorls only do we find any coloured bands retained; these, as the shell becomes mature, are lost altogether. Plain unmarked varieties occur in many of the species. *A. hadibuensis* has the coloured patches very irregularly arranged, but still oblique to the costulation; while in *A. gollonsstrensis*, the most ornamented of all, this type of coloration is crossed by a well-marked almost continuous spiral band of colour. *A. semicastaneus* presents in its form and coloration quite another sort of variation in another direction.

In bringing the list of Socotran Land-shells to a conclusion in this paper, I think it due (as a member of the Committee for the exploration of the island) to express to Prof. Bayley Balfour how much we are

<sup>1</sup> For Part I. vide *suprà* p. 251 *et seqq.*

indebted to him for the fine collection he has succeeded in bringing together in a few weeks. Having collected myself in the East, I know he must have worked hard and well to do it, pressed as he was for time, and that time primarily occupied with his own particular branch of science, botany. When we consider also the birds, reptiles, and insects &c. which he brought home, it is seen how very valuable the results have been, considering the small outlay of money. Far greater are they, and far more valuable, than those of many better known and more costly expeditions, subscribed for and sent out by scientific societies from this country.

#### Genus BULIMINUS.

Subgenus ACHATINELLOIDES, G. Neville, Dec. 1878 (Handl. Moll. Ind. Mus. p. 131), as represented in Socotra (= *Ovella*, Pfr. Nomen. (ed. Clessin), May 1879).

Group *a*. With more or less costulated sculpture.

1. *socotrensis*, Pfr., type.
2. —, var. *elongatus*.
3. *hadibuensis*.
4. —, var. *alba*.
5. *balfouri*.
6. *gollonsirensis*.

Group *b*. Smooth and polished.

1. *tigris*.
2. *zebrinus*.
3. *longiformis*.
4. *semicastaneus*.

#### Subgenus PACHNODUS, Albers.

Group *c*. Smooth, with epidermis, very thin and fragile. Very abnormal.

1. *heliciformis*.
2. *fragilis*.
3. *adonensis*.

#### 1. BULIMINUS (ACHATINELLOIDES) SOCOTRENSIS, Pfr. (Plate LXVIII. fig. 1.)

(Figured in Conch. Icon. pl. lxiv. fig. 440.)

Shell dextral, rotundately oval, very closely and narrowly rimate; sculpture close regular ribbing; colour white, the last whorl ornamented with very oblique regular bands of madder-brown crossing the costulation at right angles, becoming broader and more irregular on the apical whorls but still very oblique; spire conical, apex sub-acuminate; suture shallow; whorls 5, rounded; aperture suboblique, oval, angular above, with a strong callus on the body-whorl; peristome thin; the columellar margin flat, with a strong plication.

Largest specimens, size:—

Major diam.	0.27,	alt. axis	0.40,	alt. apert.	0.24 inch.
"	"	7.0,	"	10.1	" 6.2 millim.

Var. *alba*. Among 98 specimens nine were quite plain, but did not differ in any other respect.

*Animal*. Many specimens were found to be still alive, and survived some time, but died off gradually. Eye-tentacles moderately long, the oral tentacles long and dark; animal pale-coloured, foot pointed.

The odontophore will be figured hereafter with those of other species.

[This species is very common on trees (*Croton*, sp. ind.) on the plain of the valley at the mouth of which is the village of Gollonsir.

—*B. B.*]

2. *BULIMINUS* (*ACHATINELLOIDES*) *SOCOTRENSIS*, var. *ELONGATUS*. (Plate LXVIII. fig. 2.)

Shell rimate, ovately fusiform, very solid; sculpture regular shallow oblique costulation; colour buffy white, the last whorl below obliquely and spirally ornamented with regular umber-brown bands, which on the upper whorls become transverse splashes of colour slightly oblique to the costulation; spire elongately pyramidal, sides flatly convex; suture shallow; whorls 6, sides flat; aperture ovate; peristome sharp, only very slightly reflected near the rimation; columellar margin with a sharp internal fold.

Size:—

Major diam. 0.25, alt. axis 0.45, alt. apert. 0.22 inch.

„ „ 6.4, „ 11.0, „ 5.5 millim.

*Animal*. One alive, pale greenish grey; eye-tentacles short, dark; a white granular short patch on the fore margin of the foot.

[On the stems of *Dracæna* growing on limestone at over 2000 feet. —*B. B.*]

This shell is very close to *A. socotrensis*; but the form is more elongate, and the distribution of the bands of colour is very different: and it might be mistaken for the young of *A. balfouri*; but the whorls are flatter.

3. *BULIMINUS* (*ACHATINELLOIDES*) *HADIBUENSIS*, n. sp. (Plate LXVIII. fig. 3.)

Shell elongately fusiform, rather broadly rimate in well-grown shells, closer in the younger specimens, coarse but regular costulation; colour ochraceous brown with streaks of madder-brown running parallel to the costulation, these again overlaid with minute specks of black, apex nearly black; spire elongately pyramidal, slightly convex, subacuminate; suture shallow, adpressed; whorls 6, body-whorl the largest, sides very flatly convex; aperture ovate, more than half the length of the axis; peristome with sharp edge, slightly reflected over the rimation, regularly curved on the outer margin; columellar margin straight, with a slight sinuation within the aperture.

Longest specimen:—

Major diam. 0.4, alt. axis 0.85, alt. apert. 0.5 inch.

„ „ 10.2, „ 21.7, „ 12.5 millim.

Shortest specimen :—

Major diam. 0·36, alt. axis 0·77, alt. apert. 0·44 inch.  
 „ „ 9·0, „ 19·7, „ 11·2 millim.

[Most abundant on the trees upon the plain in the vicinity of Hadibu, on a *Croton*, which was the commonest undershrub.—*B. B.*]

This shell is closely allied to *A. balfouri*; but it may be known at once by its more elongate form, coarser sculpture, and elaborate ornamentation.

4. *BULIMINUS* (*ACHATINELLOIDES*) *HADIBUENSIS*, var. *ALBA*.  
 (Plate LXVIII. fig. 4.)

Pure white. I give a figure of the base, right side, showing the rimation; but its narrowness is, I think, due to immaturity, and not of much value.

Major diam. 0·36, alt. axis 0·82, alt. apert. 0·42 inch.  
 „ „ 9·0, „ 21·0, „ 10·5 millim.

This shell is very close to *A. hadibuensis*; but the sculpture is not so coarse.

Var. *minor* has splashes of pale brown upon the whorls, and measures :—

Major diam. 0·48, alt. axis 0·13 inch.  
 „ „ 12·0, „ 3·3 millim.

5. *BULIMINUS* (*ACHATINELLOIDES*) *BALFOURI*, n. sp. (Plate LXVIII. fig. 5.)

Shell narrowly and deeply rimate, ovately fusiform, solid; sculpture regular close oblique costulation; colour generally white, with a few dark distant longitudinal splashes on the four apical whorls; spire elongately conoid, sides convex, apex moderately sharp, suture shallow; whorls 7, last the largest, sides convex; aperture elongately ovate, nearly half the length of the shell, with a strong callus on the body-whorl in many specimens; peristome sharp, straight on the outer margin; columellar margin straight, reflected over the rimation, with a well-marked internal fold.

Longest specimen :—

Major diam. 0·39, alt. axis 0·83, alt. apert. 0·39 inch.  
 „ „ 10·0, „ 21·5, „ 10·0 millim.

Shortest specimen :—

Major diam. 0·38, alt. axis 0·68, alt. apert. 0·38 inch.  
 „ „ 9·5, „ 17·8, „ 9·5 millim.

Animal pale ochraceous, with minute speckling of brown; tentacles pale, elongate, attenuate, pointed. In some the head is mottled dark olivaceous; no pallial line.

*Locality.* General all over the island.



6. *BULIMINUS* (*ACHATINELLOIDES*) *BALFOURI*, var.

Three specimens are mottled spirally below with pale umber and white, above transversely; and the apical whorls have dark dashes near the suture at regular intervals.

Longest specimen:—

Major diam. 0·44, alt. axis 0·87, alt. apert. 0·47 inch.  
 „ „ 11·3, „ 22·5, „ 12·4 millim.

Most tumid specimen:—

Major diam. 0·37, alt. axis 0·65, alt. apert. 0·34 inch.  
 „ „ 9·6, „ 17·0, „ 9·0 millim.

[From the plain in the vicinity of Kadhoop village on the north side of the island.—*B. B.*]

7. *BULIMINUS* (*ACHATINELLOIDES*) *GOLLONSIRENSIS*, n. sp. (Plate LXIX. fig. 10.)

Shell ovately fusiform, narrowly rimate, solid; sculpture regular rather pronounced costulation; colour white or pale buff, minutely mottled with brown, with very irregular jaggy, transverse, short streaks or patches of darker brown, slightly oblique to the costulation, which do not reach to the suture above; spire elongately pyramidal, sides flatly convex, apex subacuminate, suture shallow; whorls 7, sides flat; aperture ovate, considerably more than one third the length of the axis; peristome sharp, flatly convex on the outer margin and rounded below; columellar margin reflected, nearly covering the rimation, an internal fold.

Longest specimen:—

Major diam. 0·28, alt. axis 0·66, alt. apert. 0·32 inch.  
 „ „ 7·3, „ 16·8, „ 8·0 millim.

Shortest specimen:—

Major diam. 0·21, alt. axis 0·50, alt. apert. 0·26 inch.  
 „ „ 5·5, „ 13·0, „ 6·8 millim.

[On trees, not uncommon on hill-slopes; these are from those bounding the Gollonsir valley.—*B. B.*]

The older specimens lose much of their coloration; but the fine mottling can generally be made out.

8. *BULIMINUS* (*ACHATINELLOIDES*) *TIGRIS*, n. sp. (Plate LXVIII. fig. 6.)

Shell rimate, ovately fusiform, solid, smooth and polished; sculpture lines of striae discernible under lens; colour white and buff-brown, streaked diagonally below with narrow bands of brown; above, each whorl ornamented with jagged regularly disposed transverse bands of the same colour; spire elongately pyramidal, sides slightly convex; suture shallow; whorls 6, sides slightly convex; aperture oval, subvertical; peristome thick, regularly convex on the outer margin; columellar margin with a strong plication, very little reflected.

Longest specimen :—

Major diam. 0·24, alt. axis 0·50, alt. apert. 0·22 inch.  
 „ „ 6·0, „ 12·5, „ 5·7 millim.

Shortest specimen :—

Major diam. 0·22, alt. axis 0·42, alt. apert. 0·17 inch.  
 „ „ 5·5, „ 10·8, „ 4·5 millim.

[Taken on stems of *Dracæna*, on limestone at an altitude of over 2000 feet.—*B. B.*]

This shell might at first sight be taken for *A. gollonsirensis*; but the much more open rimation and more polished surface distinguish it. It is again very similar to *A. longiformis*, but is more attenuate in form.

9. *BULIMINUS* (*ACHATINELLOIDES*) *ZEBRINUS*, n. sp. (Plate LXVIII. fig. 7.)

Shell rimate, elongately fusiform, polished, solid; sculpture indistinct transverse striæ under lens; colour milky white, with fine well-defined spiral bands of madder-brown on the last whorl, which near the suture turn sharply and change to a dark ochre tint; the dark bands are more irregular and jagged towards the apex; spire elongately pyramidal, very slightly convex; suture shallow; whorls  $6\frac{1}{2}$ , sides somewhat flattened; aperture subvertical; peristome thickened; columellar margin with a slight fold.

Longest specimen :—

Major diam. 0·19, alt. axis 0·43, alt. apert. 0·20 inch.  
 „ „ 5·0, „ 10·8, „ 5·2 millim.

Shortest specimen :—

Major diam. 0·14, alt. axis 0·37, alt. apert. 0·14 inch.  
 „ „ 4·0, „ 9·4, „ 4·0 millim.

*Locality.* On the stems of *Dracæna* on limestone at over 2000 feet, along with *A. tigris*.

10. *BULIMINUS* (*ACHATINELLOIDES*) *LONGIFORMIS*, n. sp. (Plate LXVIII. fig. 8.)

Shell very narrowly rimate, polished, solid, very elongately fusiform; sculpture indistinct transverse striæ; colour white, with elongate more or less dark-brown streaks of colour extending to apex, less defined on basal end; spire elongately pyramidal, sides flatly convex; suture shallow; whorls 7, sides flat; aperture ovate, rather more than half the length of axis; peristome sharp on the outer margin, which is slightly convex; columellar margin rather thickened, almost concealing the rimation, with an internal fold.

Longest specimen :—

Major diam. 0·28, alt. axis 0·76, alt. apert. 0·30 inch.  
 „ „ 7·2, „ 19·5, „ 8·0 millim.

Medium specimen :—

Major diam. 0·26, alt. axis 0·67, alt. apert. 0·28 inch.

„ „ 6·9, „ 17·0, „ 7·5 millim.

*Locality.* Eastern end of the island, on limestone.

11. *BULIMINUS* (*ACHATINELLOIDES*) *SEMICASTANEUS*, n. sp.  
(Plate LXVIII. fig. 9.)

Shell rimate, solid, fusiform ; sculpture fine oblique striation, to the naked eye polished ; colour milky white on last two whorls, chestnut or sienna-brown on the five apical ; spire elongately pyramidal, becoming rapidly attenuate at the apex, sides convex ; suture rather shallow ; whorls 7, body-whorl tumid, side convex ; aperture ovate, suboblique ; peristome continuous as a strong callus on the body-whorl, rather flattened on the outer margin ; columellar margin with well-marked fold, oblique, somewhat thickened and angulate near the upper inner margin.

Longest specimen :—

Major diam. 0·22, alt. apert. 0·22, alt. axis 0·39 inch.

„ „ 5·5, „ 5·5, „ 10·0 millim.

Shortest specimen :—

Major diam. 0·22, alt. apert. 0·22, alt. axis 0·37 inch.

„ „ 5·5, „ 5·5, „ 9·5 millim.

*Locality.* [South side of island on limestone rocks, nearly 1000 feet ; nine specimens were found.—*B. B.*]

12. *BULIMINUS* (*ACHATINELLOIDES*) *SEMICASTANEUS*, var. *ALBA*  
(Plate LXVIII. fig. 10.)

Shell fusiform, narrowly rimate, smooth ; sculpture fine oblique somewhat irregular striation ; colour all white ; spire elongate, sides flatly convex, apex subacuminate, suture very shallow ; whorls 6–7, sides very flat ; aperture ovoid, subvertical ; peristome sharp, continued as a thin callus on the body-whorl ; columellar margin straight, with an internal plication, slightly reflected over the rimation.

Size :—

Major diam. 0·14, alt. axis 0·36, alt. apert. 0·18 inch.

„ „ 3·7, „ 9·3, „ 4·7 millim.

*Locality.* [S.W. of Gollonsir on the limestone ridge, over 1000 feet ; only 3 specimens were obtained.—*B. B.*]

This shell is very close to *B. semicastaneus* ; but it is much flatter on the sides and not so tumid in form, and is no doubt a local variety. There are only three specimens in the collection.

13. *BULIMINUS* (*PACHNODUS*) *HELICIFORMIS*, n. sp. (Plate LXIX. figs. 7, 7a.)

Ovately fusiform, tumid, thin, diaphanous ; sculpture thin, a few transverse lines of growth ; colour olive-brown ; spire pyramidal, suture

rather deep; whorls 4, all rounded and the last much swollen; aperture broadly ovate; peristome very thin, as well as the columellar margin, where there is a slight reflexion.

Size :—

Major diam. 0·20, alt. axis 0·38, diam. apert. 0·20, alt. apert. 0·25 inch.

„ „ 5·0, „ 9·5, „ „ 5·0, „ 6·5 millim.

*Locality.* [Only found in one locality, at the base of granite cliffs above Hadibu.—*B. B.*]

Only one specimen found. This shell might be taken for a *Helix* at first sight; but its columellar margin shows it to be a close ally of the two next species, as well as the general coloration and appearance of the epidermis. Living specimens of this species and its allies would be very desirable.

14. *BULIMINUS (PACHNODUS) FRAGILIS*, n. sp. (Plate LXIX. fig. 8.)

Shell dextral, narrowly rimate, obtusely pyriform, very thin; sculpture fine irregular transverse lines of growth; colour olive-green; spire pyramidal, sides flat, apex sharp, tapering rapidly, suture moderate; whorls 5, sides flat, last whorl large; aperture oblique, ovate; peristome thin; columellar margin straight, thin and reflected.

Size :—

Major diam. 0·19, alt. axis 0·30, alt. apert. 0·13 inch.

„ „ 4·7, „ 7·5 „ 3·2 millim.

*Locality.* [From under granite boulders, hills above Adona, over 2000 feet.—*B. B.*]

15. *BULIMINUS (PACHNODUS) ADONENSIS*, n. sp. (Plate LXIX. figs. 9, 9 a.)

Shell dextral, ovately fusiform, thin, semitransparent; sculpture, under high power, epidermis rough with a few irregular transverse ridges; colour olive-brown; spire elongate, sides flatly convex; apex blunt, suture well marked; whorls 6, sides rather flat; aperture oval, oblique; peristome thin; columellar margin flat, triangular, with a slight curve or twist.

Size :—

Major diam. 0·38, alt. axis 0·27 inch.

„ „ 9·5, „ 8·5 millim.

*Locality.* [From under granite boulders, hills above Adona, over 2000 feet.—*B. B.*]

16. *ENNÆA PASSAMAANA*, Petit, Journ. Conch. 1853, p. 366, pl. xiii. figs. 7, 8. (Plate LXVIII. fig. 11.)

Shell dextral, tumidly fusiform, moderately solid, with deep hollow rimation; sculpture distinct well raised costulation; colour dull grey-white; spire acutely pyramidal, slightly convex; suture well impressed, whorls 6, all well rounded, the last with a deep dentation just behind

the aperture on the outer margin; aperture ear-shaped, contracted; peristome thin, reflected, continuous, a small double tooth on the outer margin, with another strong tooth on the columellar margin.

Largest specimen, size:—

Major diam. 0·27, alt. apert. 0·22, alt. axis 0·48 inch.  
 „ „ 6·8, „ 5·7, „ 12 millim.

*Locality.* South side of the island, on limestone rocks at nearly 1000 feet. [This shell was first discovered by a French officer of marines, Monsieur Passama.]

17. *ENNÆA BALFOURI*, n. sp. (Plate LXVIII. fig. 12.)

Shell elongately fusiform, rather solid; sculpture very regular shallow ribbing; colour wax-white or dull pale umber; spire elongate, sides convex, apex blunt; suture shallow; whorls 6, flatly convex; aperture subvertical, oval, one flat-shaped tooth on body-whorl; peristome continuous, with a narrow notch on the upper outer margin of the aperture; columellar margin strong, with a single tooth, and one largely developed triangular tooth on the outer margin.

Size:—

Major diam. 0·24, alt. axis 0·58, alt. apert. 0·24 inch.  
 „ „ 6·1, „ 14·5, „ 6·2 millim.

*Locality.* On the slopes of the ridge bounding the Gollonsir valley.

[The ridge is capped with limestone resting on a granite basis. This shell I did not find abundantly, and only on the slope of the hill below the limestone cap; altitude over 500 feet.—*B. B.*]

18. *PUPA SOCOTRANA*, n. sp. (Plate LXVIII. fig. 13.)

Shell fusiform, oblate; sculpture smooth, covered with pale umber epidermis; spire with slightly convex sides; suture shallow; whorls 6; aperture elongately oval, subvertical; peristome moderately thickened, slightly rimate on the middle of the outer margin, where there is a single rounded solid tooth; columellar margin strong, perpendicular, with a well-developed tooth.

Size:—

Major diam. 0·15, alt. axis 0·32, alt. apert. 0·13 inch.  
 „ „ 4·0, „ 8·0, „ 3·5 millim.

*Locality.* [Found under granite boulders over 2000 feet.—*B. B.*]

19. *STENOGYRA GOLLONSIRENSIS*, n. sp. (Plate LXIX. fig. 1.)

Shell dextral, elongately turreted; sculpture smooth, with shallow lines of growth; colour dull white; spire turreted, apex rounded, solid; suture moderately impressed; whorls 12, sides very slightly convex; aperture fusiform; peristome thin; columellar margin solid, straight, and scarcely reflected.

Size :—

Major diam. 0·74, alt. axis 2·45, diam. apert. 0·35,  
 „ „ 18·2, „ 61·8, „ 9·2,  
 alt. apert. 0·57 inch.  
 „ 14·3 millim.

[On limestone at an altitude of over 1000 feet on the top of the ridge overlooking Gollonsir village, and on the S.W. of it (Gollonsir is at the west end of the island); not abundant in this locality.—*B. B.*]

In the form of its aperture this shell approaches the subgenus *Bacillum* of Theobald, from Eastern India.

20. *STENOGYRA FUMIFICATA*, n. sp. (Plate LXIX. figs. 2, 2 a.)

Shell dextral, elongately turreted, solid, not rimate; sculpture irregular-sized fine transverse lines of growth crossed by spiral lines, giving a cloth-like appearance; colour ruddy ochre; spire elongate, sides convex; apex contracting rather rapidly at the sixth whorl, rounded; suture shallow, but well marked; whorls 11, regular, flat-sided; aperture semioval, angular above, rounded below, nearly vertical; peristome thin, columellar margin strong, simple, slightly curved inwards at base.

Size :—

Major diam. 0·73, alt. apert. 0·70, alt. axis 2·35 inch.  
 „ „ 18·5, „ 17·5, „ 59·0 millim.

[Common on limestone at east end of island. This shell is used often by the natives for a pipe-bowl.—*B. B.*]

This is a remarkable form, also with characters somewhat like those of *Bacillum*, and may eventually be placed in a subgenus of its own next to *Bacillum* and *Prosopaeas*.

21. *STENOGYRA JESSICA*, n. sp. (Plate LXIX. fig. 3.)

Shell elongately turreted, dextral, decollate in the three specimens obtained, scarcely rimate; sculpture very fine longitudinal ribbing; colour white; spire long, with sides flatly convex; suture very shallow; whorls 8+; sides very flat; aperture oval, oblique, angulate above; peristome thin; columellar margin weak and but slightly reflected.

Size :—

Major diam. 0·22, alt. axis 0·76, alt. apert. 0·20 inch.  
 „ „ 5·3, „ 19·2, „ 5·0 millim.

*Locality.* [Not very common. On limestone-ridge S.W. of Gollonsir, at high altitude; at 1000 feet on south side of the island.—*B. B.*]

22. *STENOGYRA ADONENSIS*, n. sp. (Plate LXIX. figs. 4, 4a.)

Shell not rimate, dextral, elongately turreted, glassy, polished; a few faint longitudinal shallow lines of growth; colour very pale ochraceous; spire high, sides slightly convex; apex blunt, rounded,

and rather rapidly tapering at the fifth whorl; suture shallow, adpressed; whorls 10, somewhat convex; aperture elongately oval, subvertical; peristome thin; columellar margin thin, straight.

Size:—

Major diam. 0·34, alt. axis 0·97, alt. apert. 0·27 inch.

„ „ 8·5, „ 24·8, „ 7·0 millim.

*Locality.* [This shell I only found in one locality, east of Hadibu, near a place called Adona, altitude over 1500 feet, rock granite.—*B. B.*]

This shell approaches somewhat in its general form to *B. magiensis*, Craven, from Magila, East Africa.

23. *STENOGYRA* (*SUBULINA*?) *ENODIS*, n. sp. (Plate LXIX. fig. 5.)

Shell dextral, elongately turreted, not rimate, very thin, glassy, diaphanous; no sculpture; colour milky white; spire long, apex blunt and rounded, suture moderately deep; whorls 9, sides convex, regularly increasing; aperture quadrate, subvertical (not fully formed); peristome thin; columellar margin straight, vertical.

Size:—

Major diam. 0·17, alt. axis 0·54, alt. apert. 0·12 inch.

„ „ 4·0, „ 13·0, „ 2·8 millim.

*Locality.* [South side of the island, from limestone rocks, altitude 1000 feet.—*B. B.*]

Only one specimen was found.

24. *STENOGYRA* (*OPEAS*?) *HIRSUTUS*, n. sp. (Plate LXIX. figs. 6, 6 a.)

Shell dextral, elongately turreted, scarcely rimate, covered with a thick epidermis; sculpture a rough surface with regularly disposed longitudinal lines of fine hairs; colour dull ochre; spire elongate, sides flat, apex blunt, suture well impressed; whorls 11, sides slightly convex; aperture oval, oblique; peristome thin; columellar margin thin, slightly reflected.

Size:—

Major diam. 0·12, alt. axis 0·45, alt. apert. 0·8 inch.

„ „ 3·0, „ 11·0, „ 2·0 millim.

*Locality.* [Found underneath granite boulders on hills above Adona, altitude over 2000 feet.—*B. B.*]

Only one specimen of this beautiful hairy shell was found.

## EXPLANATION OF THE PLATES.

### PLATE LXVIII.

Fig. 1, 1 a. *Buliminus* (*Achatinelloides*) *socotrensis*, Pfr., p. 802.

2. *Buliminus* (*Achatinelloides*) *socotrensis*, var. *elongatus*, p. 803.

3, 3 a. *Buliminus* (*Achatinelloides*) *hadibuensis*, n. sp., p. 803. 3 b, right side of base, showing rimation.

- Fig. 4. *Buliminus (Achatinelloides) hadibuensis*, var. *alba*, p. 804.  
 5. 5 a. *Buliminus (Achatinelloides) balfouri*, n. sp., p. 804.  
 6. *Buliminus (Achatinelloides) tigris*, n. sp., p. 805.  
 7. — (—) *zebrinus*, n. sp., p. 806.  
 8. — (—) *longiformis*, n. sp., p. 806.  
 9. — (—) *semicastaneus*, n. sp., p. 807.  
 10. — (—) —, var. *alba*, p. 807.  
 11. *Ennea passamaana*, Petit, p. 808. 11 a and 11 b, views of basal portion, from right side and below.  
 12. — *balfouri*, n. sp., p. 809. 12 a and 12 b, right side of base, and as seen from below vertically to columella.  
 13. *Pupa socotrana*, n. sp., nat. size, p. 809.

## PLATE LXIX.

- Fig. 1. *Stenogyra gollonsirensis*, n. sp., nat. size, p. 809.  
 2, 2 a. *Stenogyra fumifcata*, n. sp., nat. size, p. 810.  
 3. *Stenogyra jessica*, n. sp., p. 810.  
 4. — *adonensis*, n. sp., p. 810. 4 a, right side of base.  
 5. *Stenogyra (Subulina?) enodis*, n. sp., p. 811.  
 6. — (*Opeas?*) *hirsutus*, n. sp., p. 811. 6 a, epidermal hairs, magnified.  
 7, 7 a. *Buliminus (Pachnodus) heliciformis*, n. sp., p. 807.  
 8. *Buliminus (Pachnodus) fragilis*, n. sp., p. 808.  
 9. — (—) *adonensis*, n. sp., p. 808. 9 a, the columellar margin, enlarged.  
 10. *Buliminus (Achatinelloides) gollonsirensis*, n. sp., p. 805.

# 11. Notes on the Muscular Anatomy of *Cercopithecus callitrichus*. By G. E. DOBSON, M.A., M.B., &c.

[Received April 5, 1881.]

Having lately had occasion, while working at a question on general comparative anatomy, to dissect partially a fine male specimen of *Cercopithecus callitrichus*\*, I offer the following notes, then made, to the Society for publication, as they contain some points of considerable morphological interest.

Anterior bellies of the *digastrics* greatly expanded and partially double, occupying the whole intermandibular space, but united by their fascial margins only, connected posteriorly by an aponeurotic expansion with the body of the hyoid bone, the greater cornu of which is also connected laterally by a tendinous band with the well-developed intermediate tendon above, and behind by a small tendon with the lower margin of the muscular fibres forming the posterior part of the muscle, which are inserted obliquely into the intermediate tendon, the infero-internal margin of which is seen to be directly

\* The following are the measurements of this specimen:—Length of head and body (along back) 3' 7"·25; tail 2' 1"·25; ear 1"·2×1"; elbow to end of middle finger 9", knee to end of middle toe 11"·75, manus 3"·4, pollex 1"·5, middle digit 1"·5, pes 5"·3, hallux 1"·2, middle digit 2".



continuous with the postero-internal margin of the anterior belly of the muscle<sup>1</sup>.

*Sterno-mastoid* united above with *cleido-mastoid*; *cleido-occipital* inserted close to, but not united with, *trapezius*; *omo-hyoid* small, without tendinous intersection.

*Trapezius* inserted into the whole length of the spine of the scapula, also into the outer extremity of the clavicle. *Pectoralis major* arises from almost the whole length of the clavicle and from the sternum as far as the xiphoid cartilage. *Pectoralis minor* consists of two separate parts: the anterior, from the cartilages of the third to the sixth rib, is inserted into the capsular ligament of the shoulder-joint; the *posterior*, from the aponeurosis of the external oblique, is inserted by an aponeurosis into the outer margin of the bicipital groove, being connected with the insertion of the anterior part into the capsular ligament. These divisions do not touch each other, but pass separately and parallel to their insertions.

*Levator claviculæ* double, from the atlas, forms two large muscles which are inserted, one behind the other, under cover of the *trapezius*, into the acromion and anterior third of the spine of the scapula; from the inferior margin of the anterior muscle a small slip of muscular fibres is detached and inserted into the outer extremity of the clavicle.

*Levator anguli scapulæ* and *serratus magnus* are so intimately connected at their insertions, that it is difficult to say where the origin of one begins or the other ends. The former appears to be represented by two perfectly separate muscles, of which one arises from the transverse process of the atlas, and is inserted into the posterior border of the scapula near its angle; the other, from the axis, is inserted immediately in front of the preceding; then follow two other muscular slips arising respectively from the third and fifth cervical vertebræ, which are continuous at their insertions with the *serratus magnus*.

The three *scaleni* are well developed: the posterior is very large, and inserted by two divisions as far backwards as the fifth rib; the inferior division passing under cover of the external oblique to its insertion, the superior is inserted into, and becomes directly continuous with the fibres of that muscle, which may thus be said to extend from the neck to the pelvis.

*Rectus abdominis et sternalis* is very broad; its fibres end abruptly anteriorly along an oblique line extending from the sternum behind the articulation of the fifth rib to the commencement of the osseous part of the third rib, where it is inserted into a fibrous aponeurosis, attached internally to the sternum and anteriorly to the first rib. From the outer margin of this aponeurosis (which equals the rectus in width, and looks like its continuation forwards, but its fibres are directed obliquely forwards and outwards) a thin flat muscle, the *sterno-costalis*, arises.

The *deltoid* is well developed; its inferior margin is connected

<sup>1</sup> See my paper, "On the Tendinous Intersection of the Digastric," Proc. Roy. Soc. 31st March 1881.

with that of the *pectoralis major*; some of the fibres of its scapular portion are inserted into the superficial fascia of the arm. *Rhomboides* consists of two parts of nearly equal extent: the first arises from the occipital bone under cover of part of the *cleido-occipital* and the *trapezius*, the second from the ligamentum nuchæ (as far forwards as the second dorsal spine) and from two or three dorsal spines, and is inserted into the inner side of the posterior margin of the scapula external to the insertion of the occipital part.

*Latissimus dorsi* divides near the axilla into two parts; the smaller is united to and inserted with the *teres major*; the other part, many times larger, after giving off the *dorso-epitrochlearis*, suddenly narrows into a small tendon which is inserted into the bicipital groove. The *dorso-epitrochlearis* is enormous, covering the greater part of the posterior and inner side of the arm; it is inserted by a tendinous expansion.

The *coraco-brachialis* is closely united with the short head of the *biceps*; it is inserted into the humerus above the middle; but a fasciculus of muscular fibres continuous with it passes on with the *biceps*, and is inserted with the latter into the radius. Covered by this muscle at its origin, a short but broad muscle, the *coraco-brachialis brevis* (*rotator humeri*, Wood) arises, and is inserted into the neck of the humerus below the lesser tuberosity.

The *extensor ossis metacarpi pollicis* is very large, and has but a single tendon, inserted into the proximal extremity of the first metacarpal bone.

*Extensor secundi internodii pollicis* is feeble, and has a single long tendon. *Extensor communis digitorum* sends three tendons to the three middle digits. *Extensor minimi digiti* forms two long tendons in the arm, which are inserted into the outer and inner sides of the fifth digit. *Extensor indicis* has also two tendons; one goes to the second digit, the other to the third, gives off also a tendon to the fourth digit. There is no trace of an *extensor primi internodii pollicis*.

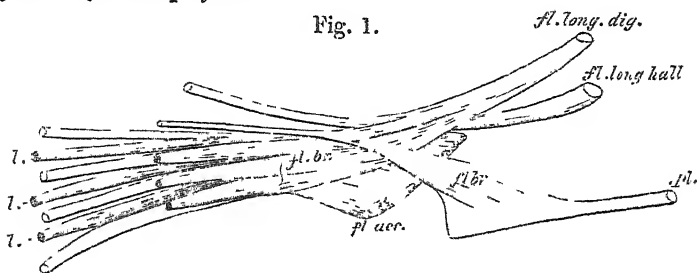
*Palmaris longus*, arising with the *flexor carpi radialis*, is inserted as usual into the palmar fascia, from which a muscular bundle of fibres arises on the radial side, and is inserted into the integument of the palm; the corresponding integumentary muscle on the ulnar side is the *palmaris brevis*, which arises wholly from the pisiform bone and annular ligament.

*Flexor digitorum profundus* arises by three heads, which, however, are closely connected together, the only approximately distinct one being that arising from the outer side of the ulna, which gives origin to the tendon for the fifth digit. The tendon for the pollex arises from the superficial surface of the common tendon; it is very much smaller than the other tendons.

From the annular ligament near the insertion of the tendon of the *flexor carpi radialis* arises a small muscle, the fibres of which occupy a space scarcely exceeding that which would be taken by a split pea; this muscle forms a very slender tendon, which, passing superficially across the large *abductor pollicis*, gets to the ulnar

side of the tendon of the *flexor profundus* for the pollex, and is inserted into the base of the terminal phalanx of that digit. The *abductor*, *adductor*, and *opponens pollicis* are well developed; the *flexor pollicis brevis* smaller, and quite concealed by the *abductor pollicis*. These last four muscles are quite distinct from the small muscle above described, which arises much higher up, and the tendon of which passes forwards superficial to all. It is difficult to trace the homology of this muscle, which corresponds in its insertion to that of the *flexor pollicis longus* of human anatomy, but differs altogether in its origin. Is it a separated part of the *abductor pollicis* or of the *flexor pollicis brevis*?

The *abductor minimi digiti* is very large, arising by two heads, one from the pisiform bone, the other from the annular ligament in common with the *flexor minimi digiti*; both unite to form a round tendon, which has the usual insertion. *Flexor minimi digiti* is also well developed, and larger than the *flexor ossis metacarpi minimi digiti*. The four *lumbricales* are well developed; they arise together from the palmar surface of the yet united four inner tendons of the *flexor digitorum profundus*.



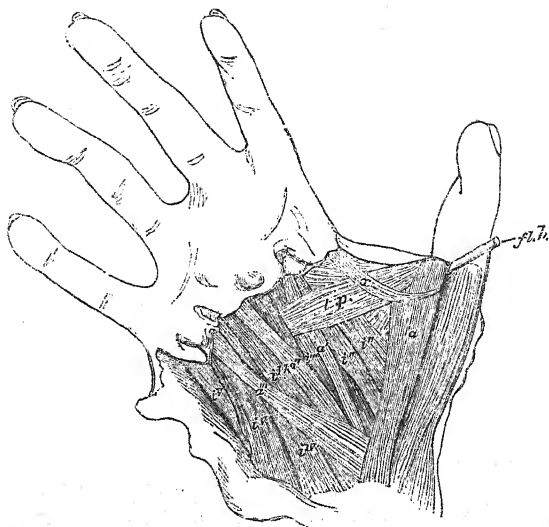
*Cercopithecus callitrichus.*

Flexor muscles of right foot, ad. ♂.

*fl. br.* Flexor digitorum brevis; *fl. acc.* flexor accessorius; *l. 1., 2., 3.* lumbricales; *fl. long. dig.* flexor longus digitorum (distr. to second and fifth toes); *fl. long. hall.* flexor longus hallucis (distr. to first, third, and fourth toes); *pl.* tendon of plantaris.

In the foot the *flexor digitorum brevis* tendon for the second digit arises from a bundle of muscular fibres having their origin wholly from the expanded *plantaris* tendon; lower down it is joined by a few muscular fibres arising from the tendon of the *flexor digitorum longus* (fig. 1.), the other *flexor brevis* tendons having their origin from muscular fibres arising from the conjoined tendons of the *flexor digitorum longus* and *flexor hallucis longus*. The three *lumbricales* are well developed and have the same mode of origin in both feet, arising from the inner sides of the flexor tendons for the three outer toes, into which they are inserted. The *transversus pedis* is present, but instead of arising, as in the human foot, from the extremity of the fifth metatarsal bone, arises from that of the second and by a fascial aponeurosis from the shaft of the third (fig. 2).

Fig. 2.

*Cercopithecus callitrichus.*

Adductor muscles and flexores breves vel interossei of right foot, imm. ♀.

- a.* Adductor hallucis; *a'*. adductor indicis; *a''*. adductor annularis; *a'''*. adductor minimi digiti; *i''*, *i'''*, *i''''*, *i'''''*. plantar interossei (second to fifth toes); *t. p.* transversus pedis; *fl. h.* tendon of flexor longus hallucis.

The adductors of the second, fourth, and fifth digits arise together in close connection, partially under cover of the origin of the *adductor hallucis*; that for the second digit is much smaller than the others. The plantar *flexores breves vel interossei* are well developed, a pair for each digit inserted into the sides of the base of each first phalanx; the innermost of the pair for the middle digit is strengthened by receiving near its insertion an additional strong muscular fasciculus arising from the scaphoid bone.

The specimen from which the above notes have been taken, was sent from Barbadoes (into which island it was no doubt imported from the west coast of Africa), and corresponds in all respects to specimens in the British Museum labelled "*Cercopithecus sabæus*;" but this name is restricted by Schlegel<sup>1</sup> to a closely allied species from Eastern Africa. In the 'Proceedings' of this Society for Jan. 1865, pp. 43-46, Mr. Mivart has published 'Notes on the Myology of a specimen of *Cercopithecus sabæus*;' but my specimen (if belonging to the same species) presents many important differences in its anatomy, which may be briefly exhibited as follows:—

<sup>1</sup> Monographie des Singes, 1876, p. 75.

*C. callitrichus* (Dobson):

1. *Omo-hyoid* present.
2. *Trapezius* partially inserted into the clavicle.
3. *Pectoralis major* arose from almost the whole length of the clavicle.
4. *Pectoralis minor* consisted of two very distinct portions, one of which was inserted into the capsular ligament, the other into the edge of the bicipital groove.
5. *Levator claviculæ* partially inserted into the clavicle.
6. *Extensor ossis metacarpi pollicis* had but a single tendon.
7. *Extensor indicis* gave off (in addition to those for the second and third digits) a tendon for the fourth digit also.
8. *Lumbricales* had similar origins in both feet.
9. *Plantar interossei* inserted by pairs into the sides of the proximal extremities of the phalangeal bones.

*C. sabæus* (Mivart).

1. No *omo-hyoid*.
2. *Trapezius* had no insertion into the clavicle.
3. *Pectoralis major* without the clavicular origin.
4. *Pectoralis minor* consisted of two very distinct portions, which were together inserted into the capsular ligament.
5. *Levator claviculæ* not at all inserted into the clavicle.
6. *Extensor ossis metacarpi pollicis* gave rise to two tendons.
7. *Extensor indicis* gave off tendons to the second and third digits only.
8. *Lumbricales* had different origins in both feet.
9. *Plantar interossei* inserted like the palmar interossei of the human hand.

Other less important differences might also be noted in the connections of other muscles as described; but these might be found between any two specimens of the same species. If Mr. Mivart's specimen really belonged to the same species as mine does, the muscular differences above noted are exceedingly remarkable.

Since writing the above, I have been enabled, through the kindness of Mr. W. A. Forbes, Prosector to the Society, to dissect another specimen of this species, a young female which had lately died in the Society's Gardens. The general conformity in its muscular structure with that of the robust male above-described was remarkable, the slight differences observable being almost confined to the extremities. The *omo-hyoid* was even better developed, and was united, at about an inch from its insertion, with the outer margin of the *sterno-hyoid*; the *trapezius* had not only a clavicular insertion but occupied fully one third of that bone; although the *levator claviculæ* arose by a single head from the atlas, it soon divided into two large muscles as above described. In the right forearm a remarkable individual peculiarity was found: the tendon of the *extensor secundi internodii pollicis* ended abruptly above the carpus by being inserted into the interosseous ligament, and the tendon for the pollex was derived from the *extensor indicis*, which, as in Mr. Mivart's specimen, sent a tendon to the third but none to the fourth digit. The small anomalous muscle described above as arising from the annular ligament near the insertion of the tendon of the *flexor carpi radialis*, and inserted into the terminal phalanx of the pollex was not found. In the foot the only differences noticeable were found in the short flexor tendon for the second digit, which was not connected by muscular fibres with the tendon of the *flexor digitorum longus*, and in the presence of a separate muscular slip which arose

with the *transversus pedis* from the extremity of the second metatarsal bone, and became united with the fibres of the *adductor hallucis* (fig. 2).

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November 15, 1881.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, September, and October, 1881:—

The total number of registered additions to the Society's Menagerie during the month of June was 153, of which 46 were by birth, 69 by presentation, 31 by purchase, and 7 were received on deposit. The total number of departures during the same period by death and removals was 120.

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The registered additions to the Society's Menagerie during the month of July were 94 in number; of these 31 were acquired by presentation, 20 by purchase, 14 by exchange, 18 by birth, and 11 were received on deposit. The total number of departures during the same period by death and removals was 97.

The most noticeable additions during the month were:—

1. Eight Menobranchs (*Menobranchnus lateralis*) from North America, examples of this singular Amphibian with external gills not having been previously received.

2. A Surucucu Snake (*Lachesis mutus*) from Pernambuco, Brazil, presented by C. A. Craven, Esq., July 27th.

This deadly Serpent forms a new and most interesting addition to the series of Venomous Snakes in the Snake-house.

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The total number of registered additions to the Society's Menagerie during the month of August was 111; of these 66 were acquired by presentation, 30 by purchase, 3 by birth, 10 were received on deposit, and 2 in exchange. The total number of departures during the same period by death and removals was 72.

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The total number of registered additions to the Society's Menagerie during the month of September was 112; of these 53 were acquired by presentation, 38 by purchase, 4 were bred in the Gardens, and 17 were received on deposit. The total number of departures during the same period by death and removals was 68.

The most interesting acquisition of the month was a specimen of the Rubiginous Cat (*Felis rubiginosa*) from Ceylon, presented by Charles E. Pole Carew, the species being new to the Society's collection.

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The total number of registered additions to the Society's Menagerie during the month of October was 114, of which 4 were by birth, 71 by presentation, 27 by purchase, and 12 on deposit. The total number of departures during the same period by death and removals was 101.

The most noticeable additions during the month were:—

1. An example of the little-known Bornean Carnivore *Hemigalea hardwickii*<sup>1</sup>, new to the Society's collection. The specimen measures about 2 feet long in the body, the tail 18 inches. It is very shy and fierce, and nocturnal in its habits. When handled it ejects a highly acrid and skunk-like secretion from its anal glands.

2. Two female Beatrix Antelopes (*Oryx beatrix*), obtained from the great desert behind the mountainous district of Oman, Muscat, by Lieut.-Col. S. B. Miles, British Consul at Muscat, and presented to the Society by Lord Lilford, F.Z.S.

This rare Antelope has, so far as I know, been only three times previously brought alive to this country. (Cf. P. Z. S. 1872, p. 603, and 1878, p. 789.) One of the present examples is in good condition; the other is unfortunately much injured about the head.

The following Reports on the Insect-house, by Mr. W. Watkins, were also read:—

*Report of the Insect-house for July 1881.*

Cage No. 1. This cage has been tenanted with cocoons of *Samia gloveri*; two cocoons still appear likely to emerge.

No. 2. *Samia cecropia*.—The eggs obtained from this species, like the preceding, hatched; and the larvæ fed rapidly, attaining over an inch in length; but in three days the whole brood died, being attacked with diarrhœa. An entomological friend of mine had a large number of imported cocoons from the same source as those belonging to the Society; and the progeny, to the number of some thirteen hundred, all died soon after moulting for the first time, from the same cause, which I attribute to degeneration, the cocoons imported having been obtained in confinement. A further small supply of larvæ was obtained from Madame Simon of Brussels; and these larvæ are doing quite well at present, only one having died, and that from some injury received *en route*. No further imagos have emerged during July; the case, however, has been kept furnished with cocoons until larvæ are of sufficient size to transfer to it from bell-glasses.

No. 3. *Attacus cynthia*.—Imagos of this species emerged at intervals during the greater part of the month, and eggs for succession were obtained; these have hatched and are feeding inside a muslin bag attached to a lilac tree near the Insect-house, and growing slowly, as desired, for late exhibition. Another and earlier brood are exhibited

<sup>1</sup> *Viverra hardwickii*, Gray, Spicil. Zool. ii. p. 9 (1830); *Viverra boiei*, Müll. & Schl. Verh. Zool. p. 120, t. 18; *Hemigalea hardwickii*, Gray, P. Z. S. 1864, p. 524.

in the case, and are now a nice size, doing quite well; they will probably spin during August.

No. 4. *Attacus pernyi*.—The eggs obtained of this hardy species hatched and fed up well, and a fine group of larvæ were exhibited throughout the month; there are now about 40 full-sized cocoons in the case, which will produce imagos during August for second brood. This species thriving well upon evergreen oak, can be fed far into the autumn.

No. 5. *Attacus atlas*.—Imagos of this species were exhibited alive in the case throughout the month. A fine group of 11 perfect insects emerged on Sunday, 24th instant. This is an extremely difficult species to induce to copulate. I have tried honey sponge and other methods unavailingly, so that only about 10 per cent. of the imagos have copulated, which, however, have given a nice lot of eggs.

The first brood of larvæ died after first moulting. The second brood, hatched June 20, have done very well, and have been exclusively fed upon a shrub (evergreen) common in the gardens; so that this, like the preceding species, can be fed into the late autumn.

No. 6. *Attacus mylitta*.—Fine imagos of this species appeared on the 3rd, 10th, 12th, 20th, and 24th, unfortunately at too wide intervals to obtain eggs. There appear to be ten more cocoons still likely to emerge.

[The insect bred on the 3rd unfortunately escaped, flying with great rapidity out of the cage when it was opened, and through the narrow window at the end out into the open. A good search was made; but it was not found. Some very fine specimens of unusually bright colour have been preserved.]

No. 7. *Actias selene*.—Perfect specimens appeared on the 7th, 10th, and 23rd instant, and, being in very fine condition, were preserved. Unless the sexes emerge same day, there is little likelihood of procuring fertile eggs; and the species will not retain its beauty after one night; invariably on the following morning the insect is in a very battered condition.

No. 8. *Actias luna*.—One specimen of this species emerged on the 6th instant; there appear to be others yet likely to come out.

No. 9. *Telega promethea*.—Small larvæ of this species have been exhibited from eggs obtained in June; but the little brood of 17 larvæ died on the 10th instant. I hope for more later on.

No. 10. *Antheraea yama-mai*.—A fine female of this species emerged on the 22nd instant from eggs hatched April 16th, being 3 months and 6 days reaching maturity. I expect others to emerge, and so to get second brood.

No. 11. Hybrids between *Attacus pernyi* and *Attacus roylei*.—Five larvæ, reputed to be these, were kindly deposited by Lord Walsingham on the 4th instant. One died the following day; three have formed cocoons; and the fifth is still feeding, but growing very slowly, if at all. I have been unable to detect any difference between these larvæ and those of *Attacus pernyi*.

No. 12. *Aglia tau*.—Five fine larvæ of this species were deposited



by Lord Walsingham on the 4th instant. Four have spun up in the moss and, I hope, changed to pupæ; but it is best not to disturb them at present. One has died. This cage now contains the larvæ of *Attacus atlas*.

No. 13. *Papilio machaon*.—Small larvæ were obtained from the Cambridge fens on the first day of the month and placed in the cage. They grew rapidly, feeding upon carrot-top, and spun up in 10 days; they are now (August) emerging perfect and of full size. This is the second brood of this species. All the pupæ obtained changed on the top of the cage, and were not, as usual, of a pale yellow-green deepening to a fine dark green along the back, but were dirty white, changing to a dark amber-colour along the back. I have seen pupæ of this species of the same colour from Germany and France (reared in confinement), but only very rarely in England.

No. 14. *Deilephila euphorbiæ*.—Pupæ of this species emerged during the month in fine condition; and the imagos were much admired. Two of these were observed hovering over the flowers in a most natural manner.

No. 15. *Erebia medea*.—The larvæ of this species placed in the cage in June produced fine imagos almost every day during July.

No. 16. *Lycæna corydon*.—Larvæ of this pretty little Butterfly were obtained from Canterbury and fed up, changing to healthy pupæ, and producing many imagos during the early part of the month. The cage is now tenanted with *Smerinthus ocellatus*.

No. 17. *Polyommatus phleas*.—Larvæ of this little Butterfly were obtained and placed in the cage, and fed upon *Rumex*; they produced perfect specimens about the middle of the month for some days. After this species was over, the cage was stocked with *Sphinx ligustri*.

No. 18. *Saturnia carpin*i.—Larvæ obtained from eggs spun up on the 17th instant; a further supply of larvæ which was obtained produced cocoons about the same time, a nice lot of which are reserved for next spring.

No. 19. *Vanessa antiopa*.—Larvæ of various growths and pupæ of this species were obtained from Germany; and imagos appeared from the 21st instant, the three stages being exhibited alive. The imagos feasted upon over-ripe plums placed in the cage for them.

No. 20. *Zygæna filipendula*.—Larvæ and pupæ of this species were obtained from the South coast, and the imagos emerging in a few days made a very pretty exhibition during most of the month in this cage.

No. 21. *Chærocampa elpenor*.—A full-fed larva of this species was presented by Mrs. Frances Smith on the 16th instant, having been found in her garden devouring the fuchsias; it spun up under the moss the following day. A further supply of the larvæ was obtained a few days later; some of them have spun up; others are still feeding upon Virginian Creeper, an excellent substitute for *Galium*, their usual food-plant.

No. 22. *Lasiocampa quercifolia*.—Imagos of this species have been exhibited throughout the month; many fertile eggs were also

obtained, some of which have hatched, and are kept in the studio in a proper vessel for hibernation. An experiment is being tried with some few of these larvæ in order to force them to become imagos before winter; they are growing slowly at present.

No. 23. *Cerura vinula*.—A nice lot of small larvæ of this species was presented by Mrs. Blandford. A part of these placed at once in this cage fed up quickly, and are now in cocoons, having spun up in a piece of cork placed in the cage for them; the other half are now in the cage as larvæ of different growths.

No. 24. *Cossus ligniperda*.—Almost every day a larva of this species has come out of the piece of willow exhibited in the cage; after crawling about, it has reentered the branch. There are two growths in the wood—those of last year's hatching and of the previous year.

No. 25. *Lasiocampa quercus*.—Larvæ of this species have been exhibited, but at present no cocoons formed; it is a difficult larva to breed.

No. 26. *Orgyia antiqua*.—A plentiful supply of the larvæ of this abundant species has been obtained from the gardens; and when a female has freshly emerged in this cage, it has attracted from the outside a number of males. One morning the cage was quite beset with those amorous little creatures, which refused to be driven away, and could easily be picked up by the fingers; at other times this is not an easy species to capture.

In the small cages at the end of the house, and on the tables, have been exhibited in succession such insects as appear at this season.

Pupæ of *Lithosia quadra* were obtained from the New Forest, but a small percentage of imagos appeared, the majority being infested with *Ichneumon* flies.

*Liparis monacha*, also received from the same locality in the same condition. Larvæ of *Biston hirtaria*, *Acronycta psi* and *A. megacephala*, and other common species occurring about London, have been gathered and exhibited; also larvæ of the Ladybirds (*Coccinellidæ*), Lacewing flies (*Hemerobiidæ*), the larvæ of which are named Aphis-lions, from feeding upon Aphides.

Perfect specimens of the Ant-lions (*Myrmeleon*) commenced to emerge this month, and some fine ones have been preserved.

*Selenia illustraria*.—Some eggs of this pretty species were presented to the Society during the month by Miss Golding Bird, and hatched the following day, the 20th instant. A part of these are now exhibited in a tube; the others are retained for future exhibition.

*Heterogynis pennella*.—These little larvæ, presented by Lord Walsingham, grew to about half size and died; their proper food may perhaps be obtained in a future season.

*Orgyia*, sp. inc.—Lord Walsingham deposited two larvæ of an unnamed *Orgyia* from North America. I was able to breed a fine specimen on the 26th instant, which has been preserved.

Some mangolds infested with the larva of the Dipteron *Anthomyia betæ* were sent in reply to a request of mine, and exhibited with a short notice.

*Arctia parasita*.—Larvæ of this species were deposited by Lord Walsingham, and all are now in pupa, kept in the cool studio.

*General Remarks*.—During the past month I have communicated with many entomologists throughout the world; and I hope by this means that the Society will in due course receive many nice specimens from abroad for the Insect-house. A correspondent in Rio (Mr. Bonninghausen) has already expressed his willingness to assist, and is for that purpose feeding up *Attacus auratus* and other Saturniidæ for exhibition later on. I have also asked for cocoons of the giant *Cetonia Goliathus torquatus* &c., from a correspondent, Mr. Fuller, of Camaroons, West Africa.

*Report of the Insect-house from August 1st to  
September 17th, 1881.*

Case No. 1. *Samia gloveri*.—No alteration has occurred in this case since preceding report.

No. 2. *Samia cecropia*.—The larvæ of this species have not done well in the house—those obtained from Brussels growing very slowly, and diminishing by death till the last one died Sept. 8, having only attained about half-growth.

No. 3. *Attacus cynthia*.—Four cocoons were obtained from the larvæ hatched in July; and a perfect insect appeared from one of these on Sept. 4. A nice lot of the larvæ, nearly full fed, are now in the cage.

No. 4. *Attacus pernyi*.—The cocoons obtained in July produced fair-sized imagoes for the summer brood; and throughout August living moths were exhibited. A very large number of eggs were obtained. These hatched on August 29; and there are now in this case and in glass vessels about 300 larvæ feeding up; these will continue feeding into November.

No. 5. *Attacus atlas*.—Imagoes were exhibited alive throughout the month of August. I obtained four fair-sized cocoons from the larvæ reported on last month; and these, I anticipate, will emerge in October. These are now exhibited.

No. 6. *Attacus mylitta*.—The sexes of this species not emerging together, no fertile eggs were obtained from our stock. I procured a few eggs from a correspondent; but these were not fertile; so I procured 50 small larvæ, which are now feeding nicely, and will, I hope, produce cocoons, although started so late; however, they feed nicely upon the evergreen oak, which can be procured as long as required.

No. 7. *Actias selene*.—No change has taken place in this case since my last Report.

No. 8. *Actias luna*.—The same remark applies to this case as to no. 7; as, however, both hold cocoons that appear alive, they had best be retained as they are.

No. 9. *Telea promethea*.—No change has been made in this case.

No. 10. *Antheræa yama-mai*.—No more cocoons have emerged.

No. 11. *Attacus auratus*.—My friend, Mr. Bonninghausen, of Rio, has sent me 8 cocoons of this fine species (hitherto not recorded as bred in this country) by post; on arrival 5 were found

to have emerged in transit; the other 3 I deposited in this case, and had the pleasure of seeing a fine female emerge on August 19. I kept her some days, hoping for a male; but no more have yet appeared. My correspondent afterwards sent 6 more cocoons, which came by steamer through agents; but these, unfortunately, had all emerged *en route*. I have given him further instructions, which I hope may result in getting over a number of a later brood. This gentleman also sent me 5 apparently healthy pupæ of the lovely *Ceratocampa ixion*, which I deposited in a suitable vessel, under mould: two splendid imagos have already emerged, on the 9th and 10th September respectively, both in perfect condition; and I am hoping for others daily.

No. 12. Hybrids between *Attacus pernyi* and *A. roylei*, deposited by Lord Walsingham.—A female specimen of these emerged on August 10th, and a male on the 15th; they are both preserved for his Lordship. I cannot discern any difference between these and *Attacus pernyi*.

No. 13. *Papilio machaon*.—Larvæ were exhibited nearly all through August, and some nice pupæ obtained for next year.

No. 14. *Papilio podalirius*.—Some nice larvæ of this species were obtained from Germany, and exhibited in that and the pupa-stage throughout August; all are now in the latter stage; two are exhibited in this case, and the remainder reserved in the cool for next year.

No. 15. *Deilephila galii*.—This species followed that of *Erebia medea* in this case; and several larvæ were obtained for succession from Germany. A few pupæ have been procured from these, and are now exhibited in this case.

No. 16. *Smerinthus ocellatus*.—A few larvæ were obtained at intervals to illustrate this species; and there are now some nice pupæ: some are exhibited, and the remainder retained in the back room for next season.

No. 17. *Sphinx ligustri*.—Larvæ of this handsome species were exhibited throughout August; and some healthy pupæ have been obtained.

No. 18. *Saturnia carpini*.—Some late larvæ of this species were obtained from the North and occupied this case during August. Cocoons are now exhibited; and I have a good supply for next season.

No. 19. *Vanessa antiopa*.—From July till early in present month imagos of this interesting species have been seen alive in the case, and have been much admired on account of their great rarity in England; those exhibited are of continental origin.

No. 20. *Stauropus fagi*.—Following *Zygæna filipendulæ* in this case came the very curious larvæ of this species, which I obtained from eggs. Five larvæ attained nearly full growth, but died one by one. I had, however, a succession at hand, and the case has been continually supplied with these interesting larvæ; two are now tenants of it, and exhibit at present no signs of failing. [Mrs. Hutchinson, of Leominster, kindly sent me a larva of this species; but I fear it was injured in transit, as it died two days after arrival.]

No. 21. *Chærocampa elpenor*.—A succession of these larvæ have been obtained and are still feeding; some healthy pupæ are reserved in the cool for next year.

No. 22. *Deilephila euphorbiæ*.—The handsome larvæ of this species have been exhibited from the beginning of August to the present time, and some healthy pupæ have been obtained.

No. 23. *Cerura vinula*.—A piece of cork containing many cocoons of this species is exhibited in order to show how well concealed these cocoons lie in the bark, where they are almost unperceivable to an unpractised eye.

No. 24. *Cossus ligniperda*.—A larva of this species has been seen almost every day, wandering about the cage out of the wood and entering it again.

No. 25. *Acherontia atropos*.—I obtained 3 larvæ from Germany, which are now in pupæ: a fourth was presented by Master Kingchurch on September 2nd, and immediately went to earth. A living Moth was likewise sent by Mr. Temple of Warwick on the 10th instant, but died two days after. It is a good specimen, and has been duly preserved.

No. 26. *Vanessa c-album*.—Mrs. Hutchinson, of Leominster, kindly sent me some small larvæ of this species, which is now local in England, although very common in former years around London. These were placed in the cage and have changed to pupæ. One perfect insect appeared on the 17th instant.

In the small cases at the end of the house there have been exhibited larvæ of *Notodonta dictæa* and *N. ziczac*, *Acronycta megacephala*, *A. psi*, and *A. aceris*, *Smerinthus populi*, and *Bombyx rubi*, of all of which, with the exception of the latter, there are pupæ for next year.

In the tubes &c. on the table, amongst Lepidoptera, there are at present larvæ of *Lasiocampa quercifolia*, *Callimorpha dominula*, *Arge galathea*, and *Dipthera orion*; there are also retained in my back room for later exhibition larvæ of *Orygia pudibunda*, *Dicranura furcula*, *Bombyx quercus*, and *Halias prasinana*. Some of the above will hibernate, but can nevertheless be exhibited at intervals, being low plant feeders. The Tiger-moths can be bred all through the winter months, if it is desired. Amongst aquatic forms many interesting additions have been made; and among these are now exhibited larvæ and pupæ of *Libellula depressa*, *Ranatra linearis*, various Trichoptera, and of the following Coleoptera:—

*Dytiscus marginalis*.  
*Hydrous piceus*.  
*Pelobius hermanni*.  
*Hydroporus rufifrons*.  
*Ilybius ater*.  
 ——— *uliginosus*.  
*Agabus abbreviatus*.  
*Helophorus aquaticus*.  
*Hydrobius fuscipes*.  
*Philhydrus testaceus*.

} At present in the House.

Haliphus elevatus.	}	Retained in the cool for future exhibition.
Hyphydrus ovatus.		
Hydroporus linearis.		
Colymbetes exoletus.		
— graptus.		
Agabus dispar.		
Noterus sparsus.		

All these, except the first three, were presented by Mr. W. A. Forbes, having been from Askham Bog, near York.

On the 22nd of August a specimen of *Cholus forbesi*<sup>1</sup> was presented by Dr. Wallace of Colchester, who found this rare Rhynophore amongst some South-American orchids; it is now exhibited upon one of these plants in a suitable glass vessel. A specimen of the Great Green Grasshopper (*Acerida viridissima*) was presented by Mr. Forbes on the same day, but died a few days after. I obtained some more larvæ of the Ant-lions early in present month; and there are still many of their pits exhibited. Some imagoes have also been bred from earlier larvæ obtained.

On September 3rd a number of *Helix pomatia* were hatched from eggs deposited by the specimens presented by Lord Arthur Russell, F.Z.S., in April last.

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The Rev. Canon Tristram exhibited skins of a Darter and a Cormorant, and nine eggs of the former bird, procured on the Lake of Antioch, and made the following remarks:—

“I have the pleasure of exhibiting the skins of two birds procured by me in June of this year on the Lake of Antioch, which may be of some interest to ornithologists. The Bahr el Abiad, or “White Sea,” as it is called, is the only piece of fresh water of any extent in Northern Syria, and is formed at the junction of several affluents with the Orontes river, in the great plain which extends from Antioch (to within a few miles of which city the lake reaches) almost as far as Aleppo.

“The northern part of the lake is very shallow, and full of hundreds of little islets, being, in fact, rather a marsh than a lake. These islets are covered with reed (*Arundo donax*) and occasional marsh-shrubs. Ducks and Waders of all kinds abound; and the Common Tern (*Sterna hirundo*) breeds there. I saw no other Tern, though the lake is not twenty miles in a straight line from the sea; but I am told that several smaller species of Terns are found here.

“There were many Buff-backed and Squacco Herons and a few Night-Herons to be seen. I obtained a few eggs of the Buff-backed. But the most remarkable inhabitant was the Darter of South Africa (*Plotus leuallanti*), of which I exhibit a male specimen and a few eggs. There is a very large colony of these birds breeding on the islets in society, with nests in no way differing from those of the Cormorants. Along with them is a Little Cormorant (*Phalacrocorax pygmaeus*) in some plenty, breeding also in communities, but not on the same islets. I did not succeed in obtaining their eggs. I could

<sup>1</sup> Pascoe, Proc. Ent. Soc. 1876, p. xxx.

not reach their breeding-places, and have a suspicion, from the behaviour of the birds, that they had already hatched.

"The Darter I take to be undoubtedly the African bird; and if so, this is a very remarkable northward extension of its hitherto known range. I was told that the birds are never seen there in winter, and that they leave as soon as their young are fledged.

"The Darter is not mentioned by Shelley as found by him in Egypt. Von Heuglin gives Lake Tchad, Senegambia, the Niger, Gaboon, as well as South Africa, as its habitat. Pollen and Van Dam state that the Indian, not the African, species is found in Madagascar. Schlegel mentions a specimen at Leyden from Sennaar, which is the nearest point to Antioch where I can trace it. Altogether, as Dr. Sclater and Mr. Forbes have pointed out to me, its occurrence in North-western Syria is most extraordinary."

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Prof. Newton, V.P., exhibited the specimen of *Emberiza rustica*, recorded by Mr. William Eagle Clarke in the current number of 'The Zoologist' (p. 465) as having been shot at Easington, on the coast of Yorkshire, on the 17th of September last, remarking that it was only the second example of the species reported to have occurred in this country, and also that on the very same day another specimen was obtained in Heligoland by Herr Gätke, C.M.Z.S.

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Mr. Sclater exhibited a specimen of the Glossy Ibis (*Plegadis falcinellus*), belonging to Sir Henry Mildmay, Bart. The specimen in question had been shot on one of the lakes of Dogmersfield Park, Hampshire, on the 5th of September, 1881, by one of the under keepers, and had been mounted by Mr. G. Clothier, of Odiham. Mr. Sclater had examined the specimen, which had been ascertained to be of the male sex, in the flesh.

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The following papers were read :—

1. Notice sur la *Loddigesia mirabilis* (Bourc.).

Par L. TACZANOWSKI et J. STOLZMANN.

[Received September 9, 1881.]

Une belle série d'exemplaires de ce magnifique oiseau-mouche nous permet de donner la description de cette espèce, beaucoup plus complète qu'elle ne l'était jusqu'à ce temps. Le mâle adulte est connu depuis plus de quarante ans, sa description cependant n'était pas satisfaisante, les couleurs à ce qu'il nous paraît ne sont pas exactement définies, de même que plusieurs détails, ce qui nous a décidé à commencer par la description du mâle dans son plumage le plus parfait. On ne connaissait rien sur les habitudes de cet oiseau; nous présentons donc tous les détails qui nous sont connus et qui paraissent être intéressants.

*Trochilus mirabilis*, Bourc. P.Z.S. 1847, p. 42; Rev. Zool. 1847, p. 253.

*Loddigesia mirabilis*, Gould, Monogr. Troch. vol. iii. tab. clxi.; id. Intr. Tr. p. 99 (1861); Gr. H.-list B. Brit. Mus. i. p. 144 (1871); Sel. et Salv. Nomencl. Av. Neotr. p. 85; Muls. H. N. Ois.-Mouches, iii. p. 252; Elliot, Class. and Synops. Troch. (1879) p. 145.

*Mulsantia mirabilis*, Bp. Consp. Gen. Av. i. p. 80 (1850); Reichb. Aufz. d. Colib. p. 12 (1853); Troch. Enum. p. 9, tab. dcccxxx. f. 4888 (1855).

*Loddigiornis mirabilis*, Bp. Rev. et Mag. Zool. 1854, p. 256.

*Thaumatoëssa mirabilis*, Hein. Jour. f. Orn. 1863, p. 210.

*L. supra aureo-viridis, pileo toto squamoso splendidissime violaceo-sapphirino; subtus isabellino-albida; fascia jugulari squamosa viridi, sapphirino micante, limbo aureo circumscripto; vitta mediana abdominali nigra, hypochondriis aureo-viridibus; alis violaceo nigricantibus, tectricibus dorso concoloribus; cauda singulari, rectricibus mediis brevissimis, externis corpore triplo longioribus, maxima parte denudatis et curvatis, apice in palmulum indigotinam dilatatis; subcaudalibus binis posterioribus angustis, corpore multo longioribus, dimidio basali viridibus, terminali cyaneo-nigris et macula alba terminatis. Fem. supra aureo-viridis, pileo griseo; subtus isabellino-albida; hypochondriis aureo-viridibus, lateribus colli viridi maculatis; rectricibus mediis latis corpore brevioribus viridibus, externis duplo longioribus modice attenuatis, griseis, apice dilatatis et indigotinis; subcaudalibus posterioribus attenuatis, quam rectrices externæ brevioribus, totis albis.*

Le mâle adulte dans son plumage le plus parfait a le sommet de la tête couvert de plumes squamiformes, très lisses et graduellement prolongées sur sa partie postérieure, en y formant une huppe plate dépassant distinctement les plumes de la nuque; cette plaque est d'une belle couleur bleue de saphir, changeant dans certain jour en violet également splendide, le reste des parties supérieures du corps est d'un vert doré, tirant plus au cuivreux au cou, sur le devant du dos et sur les tectrices alaires. Le dessous du corps est d'un blanc légèrement isabelle, orné sur la gorge d'une grande cravate, étendue jusque près des yeux, puis rétrécie graduellement et prolongée par son angle postérieur jusqu'au haut de la poitrine, formée de plumes squamiformes d'un beau vert clair fort brillant, passant dans les autres directions de la lumière en outremer saphiré, le plus fort au milieu de la cravate et tirant au violet sous certaine inclination; cette cravate est entourée dans sa moitié inférieure en commençant au dessous des yeux d'une bordure d'un doré cuivreux, bordée extérieurement de noir presque mat; le milieu de la poitrine est occupé dans toute sa longueur par une large raie noire veloutée, prenant un éclat cuivreux dans d'autres directions de la lumière, cette bande est moins large au bas-ventre et d'un éclat vert beaucoup plus brillant que dans sa partie antérieure; les flancs de l'abdomen sont couverts de plumes vertes dorées, en laissant une bande blanchâtre bordant dans toute sa longueur la raie médiane foncée. Rémiges brunes avec un léger éclat violâtre. Queue très singulière et fort compliquée, à quatre rectrices; les rectrices médianes, d'un vert foncé, sont courtes et couvertes en entier par les tectrices; les externes fort



prolongées, dépassant plus de trois fois la longueur du corps sans bec, très brièvement barbées jusque près de leur extrémité, qui est terminée brusquement par une grande palette de couleur indigo foncé, traversée de nombreuses lignes plus foncées, bien distinctes sous certain jour ; cette palette est aussi longue que large, élargie d'avant en arrière jusqu'à la moitié de sa longueur, offrant dans ce point sa plus grande largeur, en ogive postérieurement ; ces deux rectrices sont courbées en demicercle dans presque toute leur longueur, de sorte que dans la position naturelle de la queue elles se croisent entre elles deux fois, c'est à dire près de leur base et dans le tiers de leur longueur ; la partie postérieure de ces rectrices prend alors la position latéro-perpendiculaire à l'axe du corps de l'oiseau ; les autres rectrices paraissent manquer complètement. Les couvertures inférieures de la queue sont longues en général, mais les deux postérieures fort prolongées, beaucoup plus longues que le corps, atténuées graduellement vers l'extrémité et terminées en pointe, sont d'un vert bronzé obscur dans leur moitié basale, passant au bleu noirâtre dans la terminale, à pointe même blanchâtre ; les autres tectrices vertes, entourées d'une bordure blanchâtre. Bec noir, presque droit, à peu près aussi long que la tête ; pattes brunes, à tarse garni jusqu'aux doigts de petites plumes blanchâtres ; iris presque noir.

La femelle est en dessus d'un vert moins doré que chez le mâle ; le sommet de la tête est d'une couleur grise, plus ou moins lustrée de bronzé, surtout dans certaines directions de la lumière ; les parties inférieures du corps sont d'un blanc lavé légèrement d'isabelle, avec les côtés du cou maculés de quelques taches vertes et les flancs de l'abdomen vert doré. Les ailes sont distinctement plus longues que chez le mâle et de la même couleur. La queue complète, composée de rectrices larges, médiocrement longues, dépassant considérablement les tectrices, à médianes jusqu'aux subexternes presque égales, ces dernières un peu plus longues que les précédentes ; les externes deux fois aussi longues que les autres, droites, peu larges dans les deux tiers de leur longueur, puis doucement élargies en une palette oblongue subelliptique ; les deux médianes sont d'un vert brillant, les autres vertes à la base et d'un noir bleuâtre à l'extrémité ; les deux externes grises dans la partie atténuée et d'un bleu indigo sur la palette ; les sous-caudales d'un blanc isabelle, les deux postérieures graduellement atténuées, atteignant les trois quarts des rectrices externes, sont d'un blanc presque pur.

Le jeune mâle dans sa deuxième année présente certaines affinités aux deux sexes des adultes : il a le vert du dessus du corps et de la tête aussi doré que le mâle adulte ; la cravate également développée mais d'un vert moins brillant et tirant sur le doré, passant dans les autres directions de la lumière en bleu moins intense et moins pur, à bordure dorée à peine distincte ; les côtés du cou fort tachetés de doré cuivreux ; le milieu du haut de l'abdomen à peine noirâtre, lustré de vert doré, cette bande foncée indiquée sur le reste du ventre par une série de taches vertes brillantes sur un fond blanchâtre ; les flancs verts-dorés plus largement que chez les adultes. La queue est comme celle de la femelle, mais plus longue, à rectrices médianes

vertes dorées, plus ou moins terminées de bleu ; les tectrices sous-caudales postérieures plus longues, atteignant presque l'extrémité des rectrices externes, vertes bronzées dans leur plus grande moitié basale, et blanches dans la terminale ; les autres tectrices vertes dorées entourées d'une bordure blanchâtre.

Les autres jeunes mâles, probablement plus adultes, ont le sommet de la tête comme le précédent, la couleur de la cravate presque aussi forte comme chez l'adulte, et presque également bordée de doré ; la bande foncée sur la poitrine presque aussi large et aussi intense que dans l'adulte ; les côtés du cou et de la poitrine plus blancs que chez le précédent ; les sous-caudales postérieures, dépassant plus ou moins les rectrices externes et presque aussi longues que celles de l'adulte, ont les couleurs disposées comme chez ce dernier, mais l'extrémité blanche est beaucoup plus longue.

Les autres jeunes mâles, à *sommet de la tête entièrement ou en grande partie couvert de plumes squamiformes bleues*, ont la cravate presque aussi brillante que l'adulte et la bande foncée pectorale plus ou moins prolongées sur l'abdomen.

Les métamorphoses des jeunes mâles présentent quelques irrégularités ; et surtout dans le développement des sous-caudales prolongées, il arrive souvent que les individus dont la coloration est plus avancée sur le corps et au sommet de la tête ont ces tectrices moins longues et terminées plus longuement de blanc que dans les individus qui n'ont encore rien de bleu sur la tête. D'après l'examen des nombreux exemplaires en transition, on peut supposer que la cravate se forme la première, puis la plaque céphalique, les deux tectrices et la bande foncée abdominale ; les deux rectrices externes sont les dernières à se développer. Stolzmann a eu un exemplaire, dans lequel une rectrice externe était droite et courte, propre au jeune âge, et celle de l'autre côté de la queue complètement développée. On peut donc présumer avec quelle célérité ces plumes doivent se développer, voyant qu'une d'elles était toute formée, tandis que sa congénère n'avait pas encore bougé de place.

	♂ ad. mm.	♂ jeune. mm.	♀ mm.
Longueur depuis l'extrémité du bec jusqu'au bout des sous-caudales . . . . .	147	122	..
„ du vol . . . . .	101	108	..
„ de la rectrice externe en arc . . . . .	160-170	..	..
„ „ „ en corde . . . . .	125	50	46
„ de la palette . . . . .	30	19	18
Largeur de la palette . . . . .	27	8-10	8
Longueur des sous-caudales postérieures . . . . .	80	42-70	35
Distance entre le croisement postérieur des rectrices et la base . . . . .	45	..	..
Longueur des rectrices médianes . . . . .	11	16	20
„ de l'aile . . . . .	40	43.5	43-45
„ du bec . . . . .	21	21	21
Largeur de la partie atténuée des rectrices externes . . . . .	..	3	..
Longueur de la rectrice subexterne . . . . .	..	..	25

Les jeunes mâles ont le minimum du vol 107 mm., maximum 111 mm.; dans des adultes le minimum est 100 mm., le maximum 102 mm.

Dans la description du mâle de cet oiseau Bourcier a commis une erreur en prenant les deux plumes droites et prolongées du milieu de la queue pour les rectrices médianes, quoique on peut reconnaître au premier coup d'œil que ce ne sont que les deux tectrices postérieures du dessous de la queue aussi fortement développées. La position de leur base sous la surface inférieure du croupion, la courbure de leurs deux barbes vers le haut, en y formant une gouttière ouverte en dessus, et leur baguette traversée dans toute la longueur de la surface supérieure d'un sillon creux, ne laisse aucun doute sur la nature de ces deux plumes. Chez la femelle et chez le jeune mâle c'est encore plus évident, car leurs rectrices médianes jusqu'aux subexternes sont bien développées et assez longues; on peut donc les compter facilement et voir que les rectrices sont en nombre normal de dix, tandis que les deux tectrices allongées et atténuées présentent les caractères indiqués plus haut, et se trouvent appliquées à la surface inférieure de la queue.

Il est évident que le développement extraordinaire des deux rectrices externes du mâle est en relation avec l'avortement des autres rectrices; les deux médianes qui restent sont petites et cachées entièrement dans les tectrices caudales; il paraît aussi que les rémiges, d'après la loi de compensation, sont considérablement moins développées que chez la femelle et les jeunes mâles. Le mâle adulte présente aussi une particularité remarquable dans ses rémiges secondaires, dont les baguettes sont plus épaisses qu'ordinairement, fort roides et courbées au bout, et produisent un son sec en vibrant.

On sait depuis longtemps que la *Loddigesia* habite les environs de Chachapoyas, chef-lieu du département "Amazonas" dans le Pérou septentrional, et paraît être localisée dans le bassin d'Ucubamba, petite rivière de la rive droite du système du Marañon. Cette contrée est dépourvue de grandes forêts, et c'est seulement dans sa partie méridionale que se trouve la forêt (Montaña) de Puma-ureu, qui, comme on le dit, communique avec les forêts de Huayabamba, c'est-à-dire la masse principale des forêts péruviennes.

Il paraît qu'une belle *Alstrœmeria*, à couleur rouge (*Bomaria formosissima*, Herb.), est-sa-fleur de prédilection, on peut au moins être sur que là où se trouve cette fleur on rencontrera notre oiseau. Cette plante fleurit depuis le mois d'août jusqu'à la fin de novembre. Comme cette fleur n'est pas visitée par la *Lesbia gracilis*, principale persécutrice de notre oiseau, le chassant des autres fleurs, la *Loddigesia* peut s'en servir à son aise. La *Lesbia* paraît avoir un certain dédain pour cette fleur: Stolzmann pendant ses nombreuses excursions dans la contrée n'a vu qu'une seule fois une *Lesbia* s'en approcher momentanément, et s'éloigner après y avoir enfoncé son bec. Elle aime aussi à visiter les fleurs d'un framboisier épineux et d'un certain arbre nommé par les indigènes "tolo" (probablement une espèce de myrthe). On rencontre quelquefois les femelles sur les petites fleurs violettes d'une espèce de piment, connu dans la contrée sous le nom d' "aji."

On ne peut pas dire que ce colibri soit commun ; au contraire on peut prétendre qu'il est peu nombreux ; les mâles adultes paraissent être beaucoup plus rares que les femelles et les jeunes mâles.

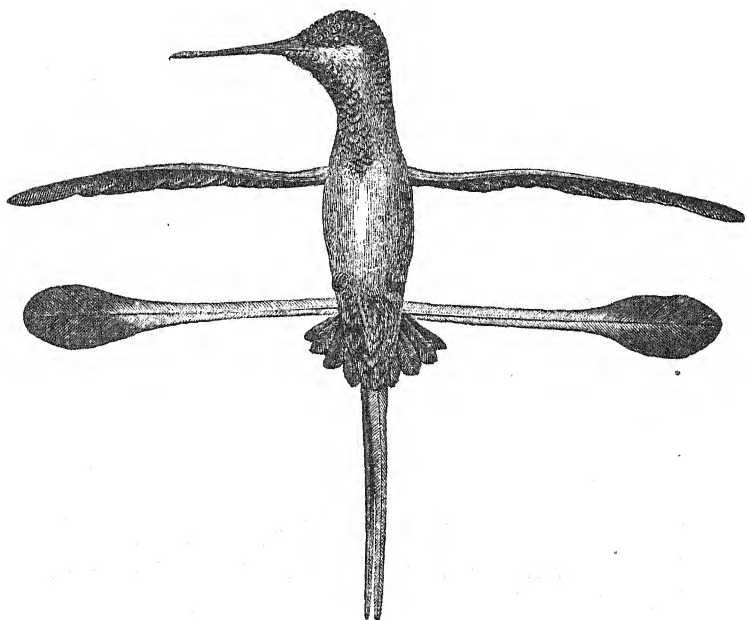
Du matin au soir ces oiseaux sont en mouvement continu. Tandis que les autres oiseaux-mouches paraissent avoir leurs heures de repos, et quelques-uns d'entre eux s'adonnent alors au chant, comme l'*Amazilia leucophaea*, on ne voit jamais la *Loddigesia* rester inactive pendant un temps un peu prolongé. Les femelles sont en général moins farouches que les mâles adultes. Leur vol n'offre aucune différence de celui des autres colibris, mais ce qu'il y a de surprenant c'est qu'elles passent avec une rapidité incroyable les fourrés les plus épais où elles sont obligées de changer de direction plusieurs fois dans une seconde pour pouvoir éviter tous les obstacles qu'elles trouvent continuellement sur leur route. En s'arrêtant aux calyces des fleurs elle remue sa queue de haut en bas à la manière des *Lesbia* et des autres oiseaux-mouches. Le bourdonnement produit au vol par une femelle se distingue facilement à l'aide d'une certaine expérience de celui de la *Lesbia gracilis*, il est d'un diapason plus élevé, ce qui s'explique par ses ailes plus courtes. Le mâle, dont les ailes sont encore plus courtes que celles de la femelle, produit un bourdonnement encore plus élevé, et on peut parvenir à reconnaître par l'ouïe la présence du mâle adulte sans le voir.

Les deux rectrices latérales du mâle adulte se dressent au vol à ce point que les deux palettes s'appliquent mutuellement. Cette position se produit machinalement. Ces rectrices peuvent se tourner jusqu'à un certain point dans leur tube basal et un léger obstacle de l'air suffit à leur donner une pareille position. On peut s'en convaincre sur les exemplaires immédiatement après leur mort, avant qu'ils soient devenus raides. Dans une pareille position les rectrices externes restent croisées et le point de leur croisement postérieur a lieu tout près de la naissance des palettes.

Une espèce des réunions exécutées par les *Loddigesia* est un fait le plus intéressant de leurs habitudes. Les observations ont été faites d'abord à Osmál, où on a vu deux ou trois jeunes mâles se réunissant ; puis le chasseur de Stolzmann a découvert à Tamiapampa l'endroit dans lequel 5 jusqu'à 8 mâles, également non adultes, s'assemblaient habituellement pour manœuvrer d'une manière la plus curieuse. Ce dernier endroit ne promettait pas la présence de ces oiseaux ; c'était un plateau découvert, parsemé de quelques buissons donnant très peu d'ombre ; il n'y avait pas des fleurs, et les oiseaux n'y arrivaient que pour exécuter leurs évolutions.

Deux jeunes mâles s'arrêtent dans l'air, l'un vis-à-vis de l'autre, le corps suspendu verticalement, ouvrant tour à tour leur queue à ce point que les rectrices externes à palettes forment une ligne droite, perpendiculaire à l'axe de l'oiseau, ou même relevées un peu en haut, et se lancent sur les côtés (Voyez la figure, p. 833). Chaque fois que l'oiseau ouvre sa queue, on entend un petit son sec, semblable au claquement produit par deux ongles d'une main, ou au bruit qu'on entend en fermant une montre. Les observations postérieures faites sur les Manakins, et l'analogie des baguettes dans les rémiges secon-

daïres de ces deux oiseaux nous conduisent à croire que ce sont les chocs mutuels de ces baguettes qui peuvent produire ce bruit. On peut l'entendre à dix pas de distance. Les deux sous-caudales allongées restent alors dans leur position naturelle, comme indépendantes du système des muscles du croupion, qui dans la *Loddigesia* sont fort développés.



*Loddigesia mirabilis* (jeune mâle, manœuvrant).

Cette manœuvre se prolonge pendant une vingtaine de secondes. Ordinairement elle est exécutée par deux jeunes mâles ; mais quelquefois, comme il est dit plus haut, un plus grand nombre se rassemble. Presque toujours on entend dans le voisinage la voix de la femelle, *tsi-tsi-tsi-tsi* . . . . Une fois Stolzmann a remarqué une pareille scène exécutée par un jeune mâle de notre oiseau devant une *Metalura smaragdini* collis.

A Tamiapampa il ne se passait pas dix minutes sans que ces manœuvres ne se soient répétées, et les oiseaux ont des endroits de prédilection pour ce but. Sur le plateau mentionné plus haut, ils avaient un buisson favori ; à Osmal il y avait deux pareils, et rarement les oiseaux manœuvraient ailleurs. En se plaçant tranquillement dans le voisinage on pouvait les observer tant qu'on voulait.

Une fois Stolzmann a été témoin d'une évolution encore plus

bizarre. Un jeune mâle restait suspendu au dessous d'une branchette fine, tandis qu'un autre manœuvrait au dessus de lui, étalant sa queue et claquant; les rôles se changeaient en un clin d'œil, le dernier se suspendait et l'autre prenait son tour; ensuite ils se sont éloignés.

Il serait curieux de connaître le but de pareilles évolutions. Serait-ce une espèce d'exercice ou une rivalité? Mais s'il en était ainsi, pourquoi les mâles adultes paraissent-ils rarement y prendre part? quoique ils y passent souvent. Une seule fois Stolzmann a vu de loin un adulte s'arrêtant devant un jeune.

Les adultes étalant également la queue donneraient à leurs rectrices externes une position extraordinaire, les deux palettes se placeraient au dessus de la tête. L'unique mouvement de la queue d'un adulte qu'a observé Stolzmann, était représenté par le dressement en haut; les palettes recouvrent alors la tête, et le corps de l'oiseau se penche en avant.

Gould prétend que les deux rectrices de la *Loddigesia* servent à lui aider à se maintenir dans l'air. Ce que nous avons dit plus haut sur l'application des deux palettes au vol paraît contester l'opinion du savant ornithologiste. L'orifice des fleurs de l'*Alstræmeria* est tourné en bas; en suçant donc l'oiseau-mouche reste suspendu au dessous de la fleur. Les rectrices restent pliées dans cette position. Du reste les ailes du mâle ne sont pas aussi petites relativement au corps pour qu'elles exigent la coopération de la queue; il y a des colibris à ailes relativement beaucoup moins grandes et volant parfaitement, comme les Acestrures. Une queue rigide paraît être mieux destinée à ce but que deux rectrices longues et flexibles, car les autres rectrices abortives ne peuvent être de grande utilité. On peut donc prétendre que ces plumes magnifiques de la *Loddigesia* lui servent d'ornement, comme celles du paon ou d'un oiseau de paradis.

Souvent il est plus facile d'apercevoir les deux palettes que l'oiseau même, et quelquefois en tirant on vise sur elles, surtout quand l'oiseau est tourné vers le chasseur et sa poitrine variée se confond facilement avec les objets voisins. Quelquefois quand l'oiseau vole dans l'ombre les palettes en mouvement sont plus faciles à distinguer.

Une fois Stolzmann a observé un mâle adulte buvant l'eau d'un ruisseau. Il avait choisi une petite cascade, et on peut prétendre que c'est seulement dans ces dernières qu'il peut apaiser sa soif. Les cascades ne manquent pas dans la contrée habitée par la *Loddigesia*. C'était avant le coucher du soleil, et l'oiseau était observé à trois pas de distance.

La voix de la femelle et du jeune mâle est un *tsi-tsi-tsi* . . . . . rapidement répété. L'oiseau se fait entendre en visitant les fleurs et pendant ses manœuvres. Posé il garde la tranquillité. La voix du mâle adulte n'a pas été jamais entendue. En novembre une femelle ramassait la mousse pour la construction du nid. C'était à l'époque des manœuvres.

2. Description d'une nouvelle espèce du genre *Mustela* du Pérou nord-oriental. Par L. TACZANOWSKI, C.M.Z.S.

[Received August 16, 1881.]

MUSTELA STOLZMANNI, n. sp.

*Obscure castaneo-brunnea; capite, pedibus apiceque caudæ concoloribus; subtus flavido-ochracea, vitta abdominali mediana brunnea, lata; labio supero latissime albo; cauda gradatim attenuata, quam corpus multo brevior.*

*Hab.* Peruvia orient. Yurimaguas (*Stolzmann*).

Une femelle adulte, tuée aux environs de Yurimaguas, est beaucoup plus grande que la *M. macroura* des environs de Junin, à queue relativement plus courte et vers son extrémité légèrement atténuée et terminée en pointe; à moustaches n'atteignant pas le bord postérieur de l'oreille; plante dans toutes les pattes parfaitement nue, d'une couleur grise, tandis que dans la *M. macroura* elle est jaune; les poils couvrant le dessous des doigts moins abondants que dans l'espèce citée; les membranes interdigitales plus longues que dans la *M. macroura* et parsemées seulement de quelques poils rares; les canines relativement plus épaisses et moins longues; les griffes plus courtes.

La mode de la coloration est semblable, cependant les nuances des couleurs sont différentes; tout le dessus du corps est d'un brun marron plus foncé que dans toutes les espèces également colorées, sans cette nuance rougeâtre caractéristique dans l'espèce avec laquelle je la compare; à base des poils plus pâle que l'extrémité sans nuance jaunâtre, propre à cette dernière belette; l'extrémité de la queue et les pattes sont concolores au dos; cependant le devant même du museau est un peu plus foncé, ainsi que l'extrémité même du pinceau caudal dont la couleur est un peu plus sombre que celle de la queue; tout le dessous du corps et le côté interne de la cuisse et du haut des jambes, ainsi que celui du milieu des pattes antérieures jusqu'à la plante dénudée est d'un ocreux jaunâtre, très différent de la couleur des deux autres espèces péruviennes à longue queue; avec une large bande brune parcourant le milieu du dessous depuis le bas de la poitrine jusqu'à la deuxième paire des mamelles, en s'atténuant dans sa partie terminale; le dessous de la tête est d'un blanc jaunâtre, s'étendant sur la lèvre supérieure jusqu'au nez et passant presque en ligne droite à 2 millimètres au dessous de l'œil et touchant ensuite le bord inférieur de la conque auriculaire, tandis que dans la *M. macroura* et dans la *M. jelskii* la lèvre supérieure est toute foncée, et la ligne de la démarcation de ces deux couleurs commence à la commissure et passe loin du bord inférieur de l'œil (12 mill. dans la *M. macroura*) sans toucher la conque auriculaire; les conques auriculaires sont parsemées de rares poils de la couleur analogue à celle du dos, quelques poils blancs forment au bord supéro-antérieur une strie bien distincte; moustaches brunes noires; ongles d'un gris corré.

## Dimensions.

	millim.
Longueur totale .....	523
„ de la tête .....	53
„ du corps .....	260
„ de la queue avec le poil .....	224
„ „ sans poil .....	190
„ du tarse jusqu'au bout des ongles	54

Cet exemplaire possède moins de fausses molaires que les autres espèces de la section des putois, c'est-à-dire une dans la mâchoire supérieure et deux dans l'inférieure; il est cependant possible qu'il les a pu perdre dans son âge avancé, car il présente des intervalles libres pour placer ces dents antérieures. En général ses dents sont plus fortes que celles de la *M. macroura*.

Cette belette a été prise dans la forêt, et il paraît que l'espèce est exclusivement forestière, car elle est inconnue aux habitants de la ville. Toutes les espèces péruviennes connues précédemment, provenaient des régions élevées à 8000 jusqu'à 11,000 pieds d'altitude, tandis que celle-ci a été trouvée dans la grande plaine de Maynas, élevée à peine à 500 pieds au dessus du niveau de la mer. Les premières habitent les contrées non boisées, tandis que celle-ci habite la forêt humide.

### 3. Note on the Structure of the Palate in the Trogons (*Trogonidæ*). By W. A. FORBES, B.A., Prosector to the Society.

[Received September 23, 1881.]

It is my desire in the present communication to correct an error which, though it has been before the ornithological world some years, has hitherto apparently escaped attention—the more so, as it has some bearing upon the general question of the classification of birds.

The only description of the palate of the Trogons I have met with is that contained in Prof. Huxley's celebrated paper on the Classification of Birds in this Society's 'Proceedings' for 1867. It runs as follows<sup>1</sup>:—"The only Trogon skull I have had the opportunity of examining is that of *T. reinwardti*. It possesses basipterygoid processes, in which respect it resembles *Caprimulgus*, and is unlike all the other genera which remain to be mentioned. The palatines have a general resemblance to those of the Musophagidæ; the vomer seems to be equally rudimentary; and the *maxillo-palatines*, though less spongy, *unite in the middle line*." The Trogonidæ are therefore included in Prof. Huxley's Desmognathous series.

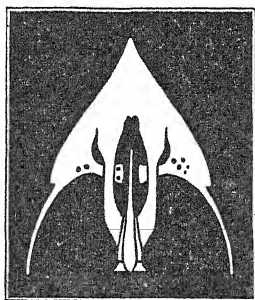
Recent examination of the skulls of several species of Neotropical Trogons (including *Trogones puella*, *mexicanus*, *atricollis*, and *caligatus*, and *Pharomacrus mocinno*), for the opportunity of which I am indebted to the kindness of Mr. Salvin, as well as of one of *Harpactes reinwardti* (the species described by Prof. Huxley) from the Eyton

<sup>1</sup> L. c. p. 444.



collection, has convinced me of the incorrectness of the last part of Prof. Huxley's description. In fact, the Trogons are not in the slightest degree desmognathous, but schizognathous, Prof. Huxley's error having probably been due to the imperfect preparation of the specimen which he inspected.

As will be evident from the drawing I now exhibit (see figure) of



Palate of *Pharomacrus mocinno*.

the palate of *Pharomacrus mocinno*, the somewhat spongy and remarkably transverse maxillo-palatines do *not* unite with each other, or with any median ossification, across the central line. On the contrary, their inner ends are free both from each other, from the lower border of the nasal septum, which is ossified, and from the thin and filiform vomer, which runs between their ends to terminate in a point a little anteriorly to them. The same is the case in the other five species already named.

The Trogons being thus, as I have shown, not desmognathous, would have, if Prof. Huxley's group of "Coccygomorphæ" were retained, to be removed thence to some other position, presumably in his suborder "Schizognathæ." But, in fact, as we now know from Prof. Garrod's investigations<sup>1</sup>, the so-called Coccygomorphæ are an artificial group, made up of at least three very distinct series of birds. Furthermore, the fact that the Trogons are schizognathous, whereas their near allies, such as the *Buconidæ*, *Galbulidæ*, *Coraciidæ*, *Podargus*, &c., are desmognathous, shows that the structure of the palate has not that unique and peculiar significance that has been claimed for it in the classification of birds.

#### 4. Note on the Systematic Position of *Eupetes macrocercus*.

By W. A. FORBES, B.A., Prosector to the Society.

[Received September 23, 1881.]

Some months ago Mr. R. B. Sharpe directed my attention to the remarkable similarity in general facies of *Eupetes macrocercus* to the

<sup>1</sup> 'Scientific Papers,' pp. 214, 215, &c.

genus *Mesites*, and suggested that that bird might be in reality closely allied to the last-named one, and not at all congeneric with the other species usually included in the genus *Eupetes*.

Our knowledge of the internal structure of *Mesites* is due to M. Alphonse Milne-Edwards, who, in the "Annales des Sciences Naturelles"<sup>1</sup> has described its osteology, with some remarks on the muscles and other points. From its osteology, as well as from the presence of two carotid arteries, and of the ambiens and accessory femoro-caudal muscles, the non-passerine nature of *Mesites* is rendered absolutely certain. M. Milne-Edwards associates it with the Rails. From the presence of powder-down patches<sup>2</sup>, combined with the schizorhinal nature of the skull, I should prefer to locate it near *Eurypyga* and *Rhinochetus* in my group Pluviales<sup>3</sup>.

It is to be regretted that M. Milne-Edwards has not in any way touched upon the pterylosis of *Mesites*; and as yet I have been unable to obtain any skin of that form to supplement this deficiency. From a skin of *Eupetes macrocerus* I have, however, been able to ascertain a sufficient number of points to show that, unlike *Mesites*, this form is certainly Passerine.

The pterylosis is quite Passerine, there being a nude oil-gland, twelve rectrices, and nineteen remiges, of which ten are primaries. Of these last the tenth (or so-called "first") is half as long as the ninth. The saddle of the dorsal tract is covered by very long feathers, some being as much as 3 inches in length. The aftershaft is apparently quite absent, as is the case in some other Passeres (e. g. *Artamus* and *Eurylemus*) according to Nitzsch. There are no traces of any powder-down patches.

In the leg there is no plantar vinculum, as in all the Eleuthero-dactylous Passeres<sup>4</sup>, and as in them only, if we except *Upupa* and certain Ardeidæ.

The arrangement of the terminal tendon of the *tensor patagii brevis* is also Passerine, as described by Garrod<sup>5</sup>, with the slight difference that, as in *Menura* and *Atrichia*<sup>6</sup>, the recurrent tendon is more or less intimately blended with that of the *extensor metacarpi* subjacent to it.

The skull, extracted from the skin, is also typically Passerine, with the characteristically truncated vomer of those birds. The maxillo-palatines are long and thin, and recurved apically; the transpalatines well developed. Like all other known Old-World Passeres, *Eupetes* is holorhinal.

The exact place in the Passerine series of *Eupetes* has yet to be determined; judging, however, from the bilaminar tarsal planta, it is a truly Oscine form, and therefore very probably to be included in the "Timeliidæ."

<sup>1</sup> 6<sup>e</sup> série, Zool. t. vii. art. no. 6, pl. vii.

<sup>2</sup> First discovered by Mr. E. Bartlett, vide P. Z. S. 1877, p. 299.

<sup>3</sup> *Antea*, p. 639.

<sup>4</sup> P. Z. S. 1880, p. 391.

<sup>5</sup> 'Scientific Papers,' pp. 356, 357.

<sup>6</sup> L. c. p. 358, pl. xxiv. fig. 2.

5. Note on *Pycnoptilus floccosus*, Gould.

By E. P. RAMSAY, C.M.Z.S.

[Received August 2, 1881.]

The true habitat of the rare bird named *Pycnoptilus floccosus* by Gould has been somewhat a mystery ever since its discovery; the belts of the Murray River were always put down as the locality from whence the original specimens came. Some years ago Mr. James Ramsay met with it on the Murrumbidgee River, but only on one occasion. Ornithologists, therefore, may be pleased to hear that the bird is an inhabitant of the coast-ranges near Sydney, New South Wales, whence I have recently seen some beautiful specimens, obtained by Mr. A. J. Thorpe, our skillful taxidermist. These birds were carefully sexed; but the sexes show no difference in the plumage. A pair measure as follows:—

	♂ inches.	♀ inches.
Total length .....	6	6
Wing .....	2.55	2.45
Tail .....	3	2.9
Tarsus .....	1.1	1.1
Bill from forehead .....	0.7	0.7
Bill from gape .....	0.75	0.73

The occurrence of *Pachycephala olivacea*, *Glycyphila albifrons*, and *Campephaga jardinii* within a few miles of Sydney is also worth recording.

Australian Museum, Sydney,  
May 27, 1881.

6. Note on *Cœliaxis layardi*, Angas.

By E. L. LAYARD, F.Z.S.

[Received August 3, 1881.]

Some years ago Mr. G. F. Angas described, in the 'Proceedings' of this Society (P. Z. S. 1865 p. 54), a curious shell sent to him by me, under the name of *Subulina (Cœliaxis) layardi*, of which the only specimens known were dead decorticated examples found on the sand-hills around East London, at the mouth of the Buffalo River, in the Cape colony. Mr. Angas, therefore, in his diagnosis, described it as "*candida*."

In 1870 I visited the Eastern province and the neighbourhood whence this shell had been procured, and, aided by my kind friend Thomas Holden Bowker, Esq., soon unearthed the first living specimens of this remarkable shell from under the sand, beneath the bushes in the neighbourhood of his residence at Tharfield. I then found that the colour of the living shell was a pale horny-grey, as was the animal, if my memory does not deceive me. My sudden

departure from the Cape necessitated the packing of my shell-collection before I had time to record the capture of the living mollusk; and my cabinets remaining unopened till a few weeks back, I thought no more of my discovery. Lately, however, I have become aware of a point in the economy of *Chilaxis layardi* that may be of interest to conchologists; and I therefore communicate this note. In picking out some specimens for exchange with a gentleman in Sydney, I was surprised to find a minute specimen fall from one I held in my hand. On tapping it gently, eight or ten more fell; and on examining others, I obtained several more. It is thus clear that this curious shell (which resembles a small *Megaspira ruschenbergiana*) is a viviparous species. The young shells show all the beautiful striae of the parent; and the young animal, showing through the pellucid shell, is of a reddish-buff colour.

Noumea, New Caledonia,  
May 20, 1881.

## 7. Notes on the Genus *Chilina*, with a List of the known Species. By EDGAR A. SMITH.

[Received August 22, 1881.]

The object of the present paper is specially to point out several errors which appear in a monograph by Sowerby in the 'Conchologia Iconica,' written in 1874; and to contradict the statement that many of the figures are taken from specimens in the British Museum. This is most important, as hereafter it might be supposed that the shells in question had been lost or in some way removed from the Museum collection. The figures in the monograph referred to are but copies in many instances of those which appeared thirty years ago in the 'Conchological Illustrations' by the same author. The figures on plate i. which are taken from the old monograph are the following:—fig. 1*a* (*C. fluviatilis*); fig. 2*b* (*C. fluminea*); figs. 3*a*, 3*b* (*C. major*); fig. 4*b* (*C. dombcyana*); and figs. 5*a*, 5*b* (*C. robustior*).

On plate ii. the following are copies:—fig. 6*c* (*C. ovalis*); figs. 7*a*, 7*b* (*C. fluctuosa*); fig. 8*a* (*C. ampullacea*); and figs. 9*a*, 9*b* (*C. gibbosa*).

On plate iii., fig. 10 (*C. puelcha*), fig. 12*a*, 12*b* probably (*C. tehuelcha*), fig. 14 (*C. tennis*), and fig. 17 (*C. parchappii*), are likewise copies.

In each instance, with the exception of fig. 14 (*C. tennis*), Mr. Sowerby states that the figures are from specimens in the British Museum. This, I am bound to observe, is totally incorrect. Not in a single case is such the fact; for neither the collection of Mr. Cuming nor that of the Museum contain any shells answering to these drawings. The only figures representing shells actually in the Museum are figs. 6*a*, 6*b* (*C. acuminata*), fig. 2*c* on plate iii. (*C. fluminea*, var.), fig. 11 (*C. patagonica*), fig. 13 (*C. elegans*), fig. 15 (*C. fasciata*), and fig. 16 (*C. subcylindrica*). Unfortunately I am

compelled to say that all these seven figures are very badly drawn and wretchedly coloured, and, in fact, are very unlike the specimens they are supposed to delineate. This will be readily believed by any one who will compare the figures in the 'Conchologia Iconica,' which are mere copies, with the originals, and see the rough manner in which they have been executed.

I am unfortunate in having to follow Mr. Sowerby's work; for it always provokes censorial criticism, which is very distasteful to me; but having under my immediate charge the collections which form the material upon which most of his monographs are founded, I feel it a duty to point out and correct such errors as I meet with, in order that it may be known that these do not exist in the Museum.

The descriptive portion of this monograph is very defective, especially with regard to references. Species 1, *C. fluviatilis*, is attributed to Gray as if a manuscript name in the Museum, whereas it was described by Maton in the 'Linnean Transactions' of 1809.

Species 2, *C. fluminea*, is likewise assigned to Gray, who, although the first to place the species in the section *Chilina*, was not the author, it having been originally named by Maton at the same time he described *C. fluviatilis*, of which it is considered but a variety by d'Orbigny and myself.

Species 4, *C. dombeyana*, is said to be of Sowerby instead of Bruguière.

Species 10, *C. puelcha* (wrongly numbered 11), is quoted as of d'Orbigny's manuscripts, whereas it has been fully described and figured by that author in the 'Voyage dans l'Amérique méridionale;' and the same observations apply to *C. tehuelcha*.

Species 13 (14 in the work), *C. elegans*, is stated to be a manuscript name of Fairfield in the British Museum. This absurdity shows Mr. Sowerby's complete ignorance of Frauenfeld's (the true author of the species) paper on this genus, published in the 'Verhandlungen der zoologisch-botanischen Gesellschaft in Wien' for 1866.

Species 15 (erroneously numbered 16), *C. fasciata*, is quoted as of Gould, followed by a —?, indicative of Mr. Sowerby's doubt whether any description had ever been published. It was described in 1847 as *Dombeya fasciata* by Gould in the 'Proceedings of the Boston Society of Natural History,' and subsequently figured in the Atlas of Wilkes's Exploring Expedition.

Finally, species 17 (wrongly lettered 18), *C. parchappii*, is referred to "Orbigny, Synopsis." This is extremely vague, being but the initial word of d'Orbigny's paper in the 'Magasin de Zoologie' for 1835, entitled "Synopsis terrestrium et fluviatilium Molluscorum in suo per Americam meridionalem itinere ab A. d'Orbigny collectorum."

The localities given in the 'Conchologia Iconica' are quite as misleading and unsatisfactory as the figures. *C. fluviatilis*, from the Rio de la Plata according to Maton and d'Orbigny, is said to be Chilian by Sowerby. *C. fluminea*, which is but a variety, and described by Maton from the same river, has the comprehensive habitat "S. America" attributed to it. Several others, viz. *C. major*, *C.*

*robustior*, *C. fluctuosa*, *C. ampullacea*, *C. gibbosa*, *C. tehuelcha*, *C. tenuis*, and *C. fasciata*, have the same vague geographical distribution assigned to them, although in some instances their precise localities were already known.

Certain species are quoted from Baldivia and Boldivia, which are misspellings of Valdivia in Southern Chile. These are *C. acuminata*, *C. puelcha*, and *C. elegans*.

The collection of this genus in the Museum contains the actual types described and figured by d'Orbigny, also the series from Mr. Cuming's collection which was recorded and named by Frauenfeld, and the types of the new species described in the 'Conchologia Iconica.' Of the nineteen species hereafter enumerated, the following are wanting—namely *C. angusta*, Philippi, *C. globosa*, Frauenfeld, *C. parva*, Martens, *C. portillensis*, Hidalgo, and *Pseudochilina limnæformis*, Dall.

#### Family CHILINIDÆ,

Dall, Ann. Lyc. Nat. Hist. N. York, 1870, vol. ix. p. 357.

#### Genus CHILINA.

*Bulinus* (part.), Bruguière; *Conovulus* (part.), Lamarck; *Auricula* (part.), Lamarck and Lesson; *Otis* (part.), Humphreys; *Voluta* (part.), Maton; *Chilina* (subgen.), Gray; *Dombeia*, d'Orbigny and Gould; *Limneus*, d'Orbigny; *Chilinia*, Woodward; *Potamophila*, Swainson.

##### 1. CHILINA DOMBEIANA, Bruguière.

*Bulinus dombeianus*, Brug. Encyclo. Méth. Hist. Nat. Vers, tome vi. p. 335, no. 66.

*Conovulus bulinoides*, Lamarck, Tab. Ency. Méth. pl. 459. f. 7 a.

*Auricula dombeyana*, Lamarck, An. s. Vert. vol. vi. p. 140; ed. 2, vol. viii. p. 331.

*Chilina dombeyana*, Gray, Spicil. Zool. p. 5; Küster, Conch.-Cab. p. 66, pl. 9. f. 18, 19; Sowerby, Conch. Ill. f. 11; id. Conch. Icon. f. 4 a, b; id. Conch. Man. f. 300; d'Orbigny, Voy. Amér. mérid., Mollusques, p. 333; Hupé, Gay's Hist. Chile, vol. viii. p. 128; Frauenfeld, Verhandl. zool.-botan. Gesellsch. Wien, 1866, vol. xvi. pp. 192-195.

*Auricula fluviatilis*, Lesson, Zool. Voy. Coquille, p. 342.

*Limneus dombeianus*, d'Orb. Mag. de Zool. 1835, p. 25.

*Chilina fluctuosa*, Sow. (non Gray) Conch. Ill. f. 2; id. Conch. Icon. f. 2; Reeve, Conch. Syst. pl. 189. f. 2.

*Hab.* Rio de Maule (d'Orbigny); river Penco, near Concepcion, Chile (Lesson).

##### 2. CHILINA FLUCTUOSA, Gray.

*Otis fluctuosa*, Humphreys, Mus. Caloumianum, p. 62.

*Auricula* (*Chilina*) *fluctuosa*, Gray, Spicil. Zool. p. 5, pl. vi. f. 19.

*Chilina fluctuosa*, d'Orb. Voy. Amér. mérid. p. 334, pl. 43. f. 13-16; Küster, Conch.-Cab. p. 64, pl. 9. f. 7-9; Frauenfeld, Verhandl. zool.-botan. Gesellsch. Wien, 1866, pp. 192-197; Martens, Mal. Blät. 1869, p. 217; Hupé, Gay's Chile, vol. viii. p. 128.

Var. = *Chilina tenuis*, Sowerby, Conch. Ill. f. 12; id. Conch. Icon. f. 14; Hupé, loc. cit. p. 129, pl. 3. f. 11?

Var. = *Chilina ovalis*, Sowerby, Conch. Ill. f. 6; Küster, f. 12-14; dentition by Dall, Ann. Lyc. N. York, 1870, vol. ix. p. 347.

Var. = *Chilina elegans*, Frauenfeld, loc. cit. p. 196 (woodcut).

*Hab.* Near Valparaíso, on the coast, in small streams which fall in cascades from the rocks and cliffs (*d'Orbigny*); Rio Concon (*id.*); South Chile, near Puerto Moutt (*Martens*).

### 3. CHILINA FLUMINEA, Maton.

*Voluta fluminea*, Maton, Trans. Linn. Soc. 1809, vol. x. p. 330, pl. 24. f. 14, 15.

*Voluta fluviatilis*, Maton, loc. cit. f. 13.

*Chilina fluminea*, Gray, Spicil. Zool. p. 5; Sowerby, Conch. Ill. f. 7; id. Conch. Icon. pl. 1. f. 2a, b, pl. 3. f. 2c; Reeve, Conch. Syst. pl. 189. f. 7; Küster, Conch.-Cab. p. 66, pl. 9. f. 15-17, pl. 10. f. 10, 11; d'Orbigny, Voy. Amér. mérid. p. 337, pl. 43. f. 19, 20; Martens, Mal. Blät. 1868, p. 184; Heynemann, Mal. Blät. 1868, vol. xv. p. 112, pl. 5. f. 11 (dentition).

*Limneus flumineus*, d'Orb. Mag. de Zool. 1835, p. 25.

*Hab.* Rio de la Plata (*Maton*); Buenos Ayres (*d'Orb.*); "Im Guahyba bei Porto Alegre" (*Martens*).

### 4. CHILINA BULLOIDES, d'Orbigny.

*Limneus bulloides*, d'Orb. Mag. de Zool. 1835, p. 24.

*Chilina bulloides*, d'Orb. Voy. Amér. mérid. p. 335, pl. 43. f. 18; Hupé, Gay's Hist. Chile, vol. viii. p. 129, Atlas, pl. 3. f. 10-10a.

*Chilina ampullacea*, Sow. Conch. Ill. f. 3; id. Conch. Icon. f. 8a, b; Reeve, Conch. Syst. pl. 189. f. 3; Küster, Conch.-Cab. p. 62, pl. 10. f. 12 (after Sowerby); Frauenfeld, Verhandl. zool.-botan. Gesellsch. Wien, 1866, pp. 192-194.

*Hab.* Island of Chiloe (*d'Orb.*).

### 5. CHILINA PARCHAPPII, d'Orbigny.

*Limneus parchappii*, d'Orb. Mag. de Zool. 1835, p. 25.

*Chilina parchappii*, d'Orb. Voy. Amér. mérid. p. 338, pl. 43. f. 45; Sowerby, Conch. Ill. f. 8; Küster, Conch.-Cab. p. 67, pl. 10. f. 5-7; Frauenfeld, Verhandl. zool.-botan. Gesellsch. Wien, 1866, pp. 192-196; Sowerby, Con. Icon. f. 17.

*Hab.* Arroyo de las Achiras, Pampas du sud, and Arroyo Salado, Pampas Répub. Argentine (*d'Orbigny*).

### 6. CHILINA GIBBOSA, Sowerby.

*Chilina gibbosa*, Sowerby, Conch. Ill. 1841, f. 4; id. Conch. Icon. f. 9a-b; Reeve, Conch. Syst. pl. 189. f. 4; Küster, Conch.-Cab. p. 68, pl. 10. f. 13-14.

*Chilina tehuelcha*, d'Orb. 1847, Voy. Amér. mérid. p. 336, pl. 43. f. 6, 7; Sow. Conch. Ill. f. 9; id. Conch. Icon. f. 12a, b; Frauenfeld, Verhandl. zool.-botan. Gesellsch. Wien, 1866, pp. 192-196.

*Hab.* Rio Negro, Patagonia (*d'Orbigny*).

## 7. CHILINA ROBUSTIOR, Sowerby.

*Chilina robustior*, Sowerby, Conch. Ill. f. 1; id. Conch. Icon. f. 5a, b; Küster, Conch.-Cab. p. 67, pl. 10. f. 1, 2 (copied from Sowerby); Frauenfeld, Verhandl. &c. pp. 192-196; Reeve, Conch. Syst. pl. 189. f. 1 (the same plate as in the 'Conchological Illustrations').

*Hab.* S. America (*Sowerby*).

The series of specimens of *C. gibbosa* in the Museum appear almost to connect it with the present species. The latter, nevertheless, may be distinct, on account of the development of the upper fold, or that above the large columellar one.

## 8. CHILINA MAJOR, Sowerby.

*Chilina major*, Sowerby, Conch. Ill. f. 10; id. Conch. Icon. f. 3a, b; Küster, Conch.-Cab. pl. 9. f. 1-2??; Frauenfeld, Verhandl. zool.-botan. Gesellsch. Wien, 1866, pp. 192-195.

*Hab.* S. America (*Sowerby*); Valdivia (*Mus. Cuming*).

This species is hardly distinguishable from *C. dombeiana*, and ought, perhaps, to be considered a large and rather broad variety of it. The figure in Küster's work does not accord with that in the 'Conchological Illustrations'; nor does his description apply to it.

## 9. CHILINA PUELCHIA, d'Orbigny.

*Chilina puelcha*, Voy. Amér. mérid. p. 336, pl. 43. f. 8-12; Sowerby?, Conch. Ill. f. 13; Küster, Conch.-Cab. p. 63, pl. 9. f. 5, 6; Woodward, Man. Moll. fig. 96; ed. 3, fig. 129 (as *C. pulchra*).

*Hab.* Rio Negro, Patagonia (*d'Orb.*).

## 10. CHILINA OBOVATA, Gould.

*Dombeya obovata*, Gould, Proc. Bost. Soc. Nat. Hist. 1847, vol. ii. p. 211; id. Otia Conch. p. 41; id. Moll. Wilkes's Explor. Exped. p. 124, pl. 9. figs. 143, 143a.

*Chilina obovata*, Gould, Otia, p. 244; Frauenfeld, loc. cit. pp. 192-195.

*Hab.* Concon River, Chile (*Gould*).

## 11. CHILINA PARVA, Martens.

*Chilina parva*, Martens, Malacozool. Blätter, 1868, vol. xv. p. 185.

*Hab.* In the primeval forest at Rödersberg, South Brazil, in small streamlets (*Martens*).

## 12. CHILINA FASCIATA, Gould.

*Dombeya fasciata*, Gould, Proc. Bost. Soc. Nat. Hist. 1847, vol. ii. p. 211 id. Otia Conch. p. 41; id. Moll. Wilkes's Explor. Exped. p. 123, Atlas, pl. 9. figs. 145, 145a.

*Chilina fasciata*, Gould, Otia Conch. p. 244; Frauenfeld, loc. cit. pp. 192-195; Sowerby, Conch. Icon. f. 15 (bad).

*Chilina acuminata*, Sow. Conch. Icon. f. 6a-b.

*Hab.* River Concon, Chile (*Gould*).

There are four bands on the last whorl, as depicted in Sowerby's wretched figure, and not three, as stated by him in the text. They



are of a brownish colour, and not strongly marked, and more like those represented in the figure of *C. acuminata*, which is undoubtedly the same species.

13. *CHILINA ANGUSTA*, Philippi.

*Chilina angusta*, Philippi, Reise durch die Wüste Atacama, 1860, p. 185.

"Ch. testa tenuiuscula, fere lanceolata, strigis flexuosis fuscis interdum vix conspicuis ornata; spiræ peracutæ anfractibus parum convexis, ultimo spiram bis æquante; apertura pyriformi, superius peracuta; plica parum prominente. Long.  $7\frac{1}{2}$  lin., latit. obliqua 4 lin., longit. aperturæ 5 lin., latit. ejus 2 lin.

"In den meisten Quellen der Küste der Wüste Atacama. Von allen verwandten Arten unterscheidet sich diese leicht durch ihre schlanke Form und die schwache Spindelfalte" (*Philippi*).

14. *CHILINA GLOBOSA*, Frauenfeld.

*Chilina globosa*, Frauenfeld, Verhandl. zool.-botan. Gesellsch. Wien, 1866, p. 197 (woodcut).

*Hab.* La Plata (*Frauenfeld*).

This is a very globular form, bearing relationship to *C. fluminea*.

15. *CHILINA PATAGONICA*, Sowerby.

*Chilina patagonica*, Sowerby, Conch. Icon. f. 11 (bad).

The outline of the above figure is fairly correct; but the colouring in the copy of the monograph before me is altogether misleading. The epidermis is olivaceous yellow, marked at intervals with a longitudinal brown narrow stripe, indicative of periods of growth. The transverse spotting is in four principal bands; and a fifth, less conspicuous, is noticeable immediately beneath the suture. The next beneath is the broadest band. The aperture is not yellow, as represented by Sowerby, but whitish, bluish white, or sometimes tinged with brown. The fold, too, on the columella is not nearly so prominent as it appears in the illustration referred to.

16. *CHILINA SUBCYLINDRICA*, Sowerby.

*Chilina subcylindrica*, Sowerby, Conch. Icon. f. 16.

*Hab.* Ancud, on the north of the island of Chiloe, South Chile (*Dr. R. O. Cunningham*).

The specimen forming the type of this species, together with others, were collected by Dr. Cunningham during the Surveying Expedition of H.M.S. 'Nassau' in 1868. The figure is incorrect, both as regards outline and colour. The penultimate whorl appears decidedly too high, making the spire too elongate. The colour is stated to be "purplish brown," which is altogether imaginary. The specimens which Mr. Sowerby had before him were coated with a blackish earthy deposit. On removing a portion of this, the ordinary greenish-olive epidermis is discovered beneath, while the shell is ornamented with four transverse bands of brown more or less arrow-head-like spots and lines. The aperture is of a somewhat pale

pinkish-brown colour, and exhibits, more or less distinctly, the external banding. The columella is white or pinkish white, and bears a single distinct but not very strong fold exactly in the middle; and the "lower small one" mentioned by Sowerby does not exist, for neither the specimens themselves nor the figure exhibit a trace of it. The species is rather thick and strong for its size, and consists of five whorls.

17. *CHILINA AMÆNA*, Smith.

*Chilina amœna*, Smith, Proc. Zool. Soc. 1881, p. 37, pl. iv. f. 18, 18a.

*Hab.* From a lake near Tom Bay, west of South Patagonia (*Dr. Copping*, *H.M.S. 'Alert'*).

This species is remarkable for its fragility, the slenderness of its form, and the vividness of the markings.

18. *CHILINA PORTILLENSIS*, Hidalgo.

*Chilina portillensis*, Hidalgo, Journ. de Conch. 1880, vol. xxviii. p. 322, pl. xi. figs. 1-1 a.

*Hab.* Portillo, Argentine Republic, at an altitude of "4000 mètres."

Subgenus *PSEUDOCILINA*,

Dall, Ann. Lyc. Nat. Hist. N. York, 1870, vol. ix. p. 357.

"Shell thin, covered with a rough fibrous epidermis; spire elevated, acute" (*Dall*).

19. *PSEUDOCILINA LIMNÆFORMIS*, Dall.

*Pseudochilina limnæformis*, Dall, Ann. Lyc. Nat. Hist. N. York, 1870, vol. ix. p. 357.

*Hab.* Chile.

"The curious epidermis and broad plicate columella alone distinguish this singular shell from a *Limnæa*" (*Dall*).

8. On Butterflies from Japan, by ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.; with which are incorporated Notes and Descriptions of new Species by MONTAGUE FENTON.

[Received September 8, 1881.]

The present paper gives an account of the Butterflies observed in Hokkaido by Mr. Fenton, together with one or two species subsequently obtained from other sources. Some of the specimens have been in my hands since 1878; but without seeing all those included in Mr. Fenton's notes it was impossible for me to publish anything concerning them. Now that the whole of the species have been submitted to me, I gladly make them known to science.

Writing from Tokio University on the 9th of November, 1878, Mr. Fenton says:—"I have received all my collections from Hok-

kaido (Yesso) in safety. In looking them over I was able to see some varieties and some species new to me, some of which I have described, and the others I have transmitted to you.

"Mr. Janson sent me a copy of the 'Cistula Entomologica' for June 30th, 1878, containing your remarks on, and descriptions of some Japanese Rhopalocera sent home by me.

"Page 281.

"*Argynnis rabdia* (No. 79).

"I have a specimen of this measuring 2" 8".

"*Melitæa niphona* (No. 84).

"The size of this species varies considerably. The smallest I have measures 1" 3", while the largest is 1" 11" in expanse.

"*Melitæa scotosia* (No. 83.)

"Specimens caught in May, at Koganenohára, 18 miles east of Tokio, are of a bright velvety tawny; while those taken on the plain at the foot of Asama, in July, are very dingy and are somewhat melanized.

"*Neptis excellens* (No. 58).

"I have since found this species just outside Tokio in May, at Somei; took two also in Shiribets, Hokkaido, last August.

"*Pararge achinoides* (No. 39).

"In the male you described the 'additional indistinct ocellus near anal angle;' it becomes *distinct* in the female.

"*Lyccæna argia* (No. 103 a).

"I have examined all my specimens of this, and am obliged to conclude it distinct. A less difference exists between *L. japonica* and *L. argia* than between the latter and *L. alope*.

"*Chrysophanus phlœas* (99) and *Gonepteryx rhamni* (12).

"I find that these came from an old collection of English insects in Japan<sup>1</sup>.

"*Thecla orientalis* (No. 98 b).

"This varies slightly from the specimens taken southwards: 'Bandai' is the name of a mountain on the north side of Inawashiro lake in Iwashira. The Japanese call all Butterflies and Moths 'Chō,' the only exceptions being some local names for *Papilio demetrius* and *P. memnon*.

"*Pamphila jansonis* (No. 125).

"♀. 'The additional white spot between the first and second of the oblique discal series' present also *above*."

\* \* \*

"Owing to the wildness of Hokkaido, I was obliged to keep to

<sup>1</sup> In my paper I doubted the authenticity of the habitat "Japan" for these two species, stating that they differed in no respect from the British species.—A. G. B.

the beaten tract; and thus I caught only those that crossed my path; besides, there were such countless myriads of female blood-sucking *Diptera* (including two species of *Chrysops*, three of *Tabanus*, one seemingly *T. lineola*, and one of *Simulium*) that I could do little else than defend my person.

"From Tomakomai to Shimamatou, a distance of thirty miles, *Lycena hellotia* had collected in patches of hundreds, drawing in the moisture from the road. They looked like fleets of miniature yachts. By one sweep of my net, I secured a hundred and six.

"I saw in Hokkaido and in Rikuoku, in the north of the main island, *Euripus japonica*: it is much smaller than those taken further south, measuring only 2" 7<sup>11</sup>."

\* \* \*

"Mr. Pryer has kindly allowed me to put my insects with some things that he is sending home by the English mail of the 12th inst. Among his bottles of preserved animals will be found one containing a small snake (No. 1) that had taken up its quarters in an old bamboo in my garden in Tokio, another (No. 2) in the road near Junsainuma near Hakodaté, a red tick (No. 3) found all over Hokkaido: I sometimes had as many as twenty on my legs; they are rather indifferent feeders, attacking horses, deer, and even the Ainos."

Enclosed is a list of "Butterflies seen in Hokkaido in July and August, over a distance of 345 miles between the parallels 41° 25' and 43° 4' N."

Mr. Fenton's list is arranged according to the now almost obsolete classification of Doubleday and Hewitson; and therefore I have thought it better for convenience of reference to remodel it, at the same time filling in such specific names as were left blank.

## NYMPHALIDÆ.

### SATYRINÆ.

- |  |   |
|--|---|
| 1. <i>Satyrus bipunctatus</i> , <i>Motsch.</i> | 6. <i>Pararge achinoides</i> , <i>Bull.</i> |
| 2. — <i>schrenkii</i> , <i>Brem.</i>           | 7. <i>Lethe diama</i> , <i>Bull.</i>        |
| 3. <i>Neope gaschkevitchii</i> , <i>Mén.</i>   | 8. — <i>sicelis</i> , <i>Hewits.</i>        |
| 4. — <i>callipteris</i> , <i>Bull.</i>         | 9. <i>Erebia scoparia</i> , <i>Bull.</i>    |
| 5. — <i>fentoni</i> , <i>Bull.</i>             | 10. <i>Ypthima argus</i> , <i>Bull.</i>     |

## NYMPHALINÆ.

- |  |  |
|--|--|
| 11. <i>Apatura substituta</i> , <i>Bull.</i> | 24. <i>Vanessa xanthomelas</i> , <i>Denis.</i> |
| 12. <i>Hestina japonica</i> , <i>Feld.</i>   | 25. — <i>comexa</i> , <i>Butler.</i>           |
| 13. <i>Limnitis sibilla</i> , <i>Ochs.</i>   | 26. — <i>io</i> , <i>Linn.</i>                 |
| 14. <i>Neptis excellens</i> , <i>Bull.</i>   | 27. — <i>antiopa</i> , <i>Linn.</i>            |
| 15. — <i>ludmilla</i> , <i>H.-Sch.</i>       | 28. — <i>glauconia</i> , <i>Motsch.</i>        |
| 16. — <i>intermedia</i> , <i>Pryer.</i>      | 29. <i>Argynnis sagana</i> , <i>Doubl.</i>     |
| 17. <i>Araschnia fallax</i> , <i>Jans.</i>   | 30. — <i>paphioides</i> , <i>Bull.</i>         |
| 18. — <i>obscura</i> , <i>Fenton.</i>        | 31. — <i>lysippe</i> , <i>Jans.</i>            |
| 19. <i>Pyrameis cardui</i> , <i>Linn.</i>    | 32. — <i>japonica</i> , <i>Mén.</i>            |
| 20. — <i>indica</i> , <i>Herbst.</i>         | 33. — <i>raddia</i> , <i>Bull.</i>             |
| 21. <i>Vanessa angelica</i> , <i>Cram.</i>   | 34. — <i>locuples</i> , <i>Bull.</i>           |
| 22. — <i>lunigera</i> , <i>Bull.</i>         | 35. — <i>fortuna</i> , <i>Jans.</i>            |
| 23. — <i>v-album</i> , <i>Denis.</i>         |  |

## ERYCINIDÆ.

## LIBYTHEINÆ.

- 36.
- Libythea lepita*
- , Moore.

## LYCÆNIDÆ.

- |   |   |
|---|---|
| 37. <i>Lampides hellotia</i> , Mén.           | 49. <i>Thecla ibara</i> , <i>Butl.</i>    |
| 38. <i>Lycæna pryri</i> , <i>Murr.</i>        | 50. — <i>orsedice</i> , <i>Butl.</i>      |
| 39. — <i>ladonides</i> , <i>De l'Orza.</i>    | 51. — <i>butleri</i> , <i>Fenton.</i>     |
| 40. — <i>lycormas</i> , <i>Butl.</i>          | 52. — <i>enthica</i> , <i>Jans.</i>       |
| 41. — <i>euphemus</i> , <i>Herbst.</i>        | 53. — <i>regina</i> , <i>Butl.</i>        |
| 42. — <i>pseudagon</i> , <i>Butl.</i>         | 54. — <i>japonica</i> , <i>Murr.</i>      |
| 43. — <i>alope</i> , <i>Fenton.</i>           | 55. — <i>orientalis</i> , <i>Murr.</i>    |
| 44. — <i>iburiensis</i> , <i>Butl.</i>        | 56. — <i>arata</i> , <i>Murr.</i>         |
| 45. <i>Scolitantides sedi</i> , <i>Fabr.</i>  | 57. — <i>signata</i> , <i>Butl.</i>       |
| 46. <i>Chrysophanus timæus</i> , <i>Cram.</i> | 58. — <i>mera</i> , <i>Jans.</i>          |
| 47. <i>Thecla lutea</i> , <i>Hew.</i>         | 59. <i>Strymon fentoni</i> , <i>Butl.</i> |
| 48. — <i>jonasii</i> , <i>Jans.</i>           |   |

## PAPILIONIDÆ.

## PIERINÆ.

- |  |   |
|--|---|
| 60. <i>Colias simoda</i> , <i>De l'Orza.</i> | 63. <i>Synchlœ megamera</i> , <i>Butl.</i>  |
| 61. <i>Aporia cratægi</i> , <i>Linn.</i>     | 64. — <i>crucivora</i> , <i>Boisd.</i>      |
| 62. <i>Synchlœ melete</i> , <i>Mén.</i>      | 65. <i>Leptosia morsei</i> , <i>Fenton.</i> |

## PAPILIONINÆ.

- |   |   |
|---|---|
| 66. <i>Papilio hippocrates</i> , <i>Feld.</i> | 69. <i>Papilio maackii</i> , <i>Brem.</i> |
| 67. — <i>xuthus</i> , <i>Linn.</i>            | 70. — <i>tutanus</i> , <i>Fenton.</i>     |
| 68. — <i>alcinous</i> , <i>Klug.</i>          |   |

## HESPERIIDÆ.

- |  |   |
|--|---|
| 71. <i>Pamphila pellucida</i> , <i>Murr.</i> | 73. <i>Pamphila venata</i> , <i>Brem.</i> |
| 72. — <i>varia</i> , <i>Murr.</i>            | 74. — <i>sylvatica</i> , <i>Brem.</i>     |

Of species not described as new in the present paper Mr. Fenton forwards the following notes:—

*Limenitis sibilla* was taken at "Hokkaido in July and August." *Neptis ludmilla* at "Iburi, Hokkaido, in the third week in July;" *Vanessa xanthomelas* in July; *Argynnis japonica*, the same; *A. rabdia* in "Southern Hokkaido in July;" *Lycæna ladonides* at "Hokkaido in July and August;" *L. lycormas*, Hakodaté, third week in July; *Scolitantides sedi* at "Kuramatsunai, Shiribetsu, Hokkaido, in August."

*Descriptions of new Species<sup>1</sup>.*

*EREBIA SCOPARIA*, Butler.

Allied to *E. nipponica*, but broader and altogether different on the under surface. Wings above rich sericeous fuliginous brown; primaries darker than the secondaries; the disk crossed by a broad, irregular, bright ochreous band not reaching the costal or inner margins, enclosing three black ocelli with white pupils, the two upper ones confluent and placed upon the radial interspaces, the third

<sup>1</sup> The species described by myself have my name appended to them; and those by Mr. Fenton have his. Several of the specific names used by me were suggested by Mr. Fenton.

placed upon the first median interspace: secondaries with three white points on the median and radial interspaces, only the first (on the first median interspace) distinct and snow-white: thorax fuliginous brown, abdomen blackish. Primaries below nearly as above, but the internal area greyish and the external border bright chocolate-brown; secondaries much as in *E. medea*, bright chocolate-brown, with faint indication of a slightly more olivaceous broad angular belt just before the middle; the disk slightly greyish, showing the white dots of the upper surface distinctly, the first of these is black-edged; fringe of all the wings dull black mottled with testaceous; pectus fuliginous brown, legs and venter pale brown. Expanse of wings 2 inches 1 line.

Kuramatsunai, Shiribetsu, Hokkaido, second week in August.

Coll. M. Fenton.

This is an interesting and well-defined new species.

*ARASCHNIA OBSCURA*, Fenton.

Allied to *A. fallax*, O. Janson (Cist. Ent. 1878, p. 271). *Male* above soot-black: primaries with four short narrow transverse lines in the cell, and one below the median vein near the base, pale ochreous; the transverse interrupted band on the disk extending quite to the costal edge at one end, but only to the submedian vein at the other, *very* pale ochreous; four spots in a curved row near the apex, the first and second, and a small linear spot about the middle and close to the margin, pale ochreous, the third (the smallest) and the fourth (the largest) and a small spot between the second and third median veinlets pure white; no irregular submarginal lunular reddish-sienna spots: secondaries produced at the middle of outer edge; no undulating reddish-sienna lines; fringe with white sinuations interrupted by black at the end of the nervures. Below pale ochreous; the irregular marks at the base reddish chocolate; the apical third occupied by a broad band of the same colour bordered inwardly with black, interrupted by the nervures: primaries with an additional small white spot in the band, between the first and second median veinlets; the markings below the cell black, dusted in some specimens with reddish chocolate. Expanse of wings 1 inch 8 lines.

Forest-lands in Hokkaido, August.

Coll. M. Fenton.

I have not examined the type of this species of Mr. Fenton's; but, from a photograph which he has shown me, I should judge it to be perfectly distinct.

*VANESSA LUNIGERA*, Butler.

Allied to *V. fentoni*, but altogether duller in colour; the black spots above considerably larger; the lunate subconfluent spots on the external area of secondaries replaced by a series of small lunules: under surface with all the bands considerably darker and broader, the silvery white J-shaped marking on the secondaries replaced by a J-shaped character. Expanse of wing 2 inches 5 lines.

N. Iburi, Hokkaido, July.

Coll. M. Fenton.

This species has the costal margin of the primaries more produced

and the apical area distinctly narrower than in *V. fentoni*: it differs from the latter in pattern and coloration much as *V. faunus* of North America does from *V. satyrus*.

VANESSA CONNEXA, Butler.

Allied to *V. urticae* of Europe, but the second black costal patch on the primaries united to the interno-median patch and the latter to the inner margin, so as to form a broad central angulated black band right across the wing; no trace of blue submarginal lunules on the primaries; the red discal area of the secondaries much narrower and the brown area darker. Wings below considerably darker, the secondaries even darker than in *V. californica*, the disk being densely striated with purplish brown; the black-edged green submarginal stripe rather lunate than sagittate, and almost wholly black on the primaries; the brown-edged lilac marginal stripe better defined and more lunulate in character. Expanse of wings 2 inches 2 lines.

Toshima, Hokkaido; July.

Coll. B.M. and Fenton.

This is quite distinct from the imperfectly banded form named by Dr. Staudinger *V. polaris*. Mr. Fenton writes respecting it:—"I have examined more than 30, and I find that they do not vary at all from the form I send you. I think it is distinct from *V. urticae*."

LYCÆNA PSEUDÆGON, Butler.

Nearest to *L. ægon* of Europe, the same colours. The male smaller and with a very narrow black outer border to the wings; fringe narrower, submarginal black spots of secondaries rather smaller; female very faintly shot with steel-blue at the base of primaries, submarginal orange lunules obsolete; secondaries darker, purplish towards the base, bluish at the base; the whole of the black submarginal spots bounded internally by orange lunules and externally by white ones. Under surface greyer than in *L. ægon*, both sexes washed with pale greenish blue at the base; black spots smaller, but arranged exactly in the same way; submarginal orange spots of the primaries of the male extremely pale; those of the secondaries destitute of metallic spots in both sexes. Expanse of wings, ♂ 1 inch 2 lines, ♀ 1 inch 3 lines.

Iburi, Hokkaido, July.

Coll. M. Fenton.

LYCÆNA ALOPE, Fenton.

Allied to *L. japonica* and *L. argia*. Male deeper violet than *L. argia*, Ménétr.: above, the dark marginal border to primaries broader; below, the black spot absent from cell of primaries; the third, fourth, fifth and sixth of the discal row of spots in the secondaries form an arc of a larger circle than the corresponding ones in *L. argia*; the second spot lies much nearer the junction of the first and second subcostal veinlets. Average expanse of wings  $1\frac{3}{4}$  line less.

Appears to be confined to the river-bed, which the Oshiukaido crosses at Akutsu, Shimódzuke; middle of July. Coll. M. Fenton.

I have not seen the type of this species described by Mr. Fenton;

but we have what I take to be the species in the Museum: our example has a very unusually prominent submarginal series of broad dusky lunules on the under surface.

*LYCÆNA IBURIENSIS*, Butler.

Allied to *L. argus*, but more nearly of the size and colour above of *L. lycaumas*. Pale silvery blue with brown veins and broad smoky-brown external borders; fringe very narrow and snow-white; secondaries with broad brown costal area; body above rather darker than the wings: under surface chalky bluish white; the base, especially in the secondaries, suffused with pale bluish green; black spots arranged as in *L. argus*, but large and intensely black; the orange lunules wanting in the marginal ocelloid spots of the primaries, paler in those of the secondaries; no metallic pupils to the black spots of the secondaries; pectus bluish. Expanse of wings 1 inch 5 lines.

Iburi, Hokkaido; July.

Coll. M. Fenton.

A very distinct and pretty species.

*THECLA IBARA*, Butler.

♀. Upper surface similar to *T. mera*, sericeous fuliginous brown: primaries with broad diffused blackish external area and costal border; fringes snow-white, spotted with black at the extremities of the veins: head olivaceous varied with snow-white. Under surface of wings golden stramineous; a discal series of black-edged orange lunate spots followed by a series of oval pearl-white spots from the upper radial of primaries to the second median branch of secondaries, the third and fourth of the primaries bounded externally by a few black scales, the fifth (or last) on the primaries bounded by a large black spot, the orange lunule also almost wholly covered by its black border; the fifth and last of secondaries bounded by a small black spot; a broad orange patch, in continuation of the discal spots, at anal angle, its inner edge bounded by two slender black lituræ; a large submarginal black spot on the inner half of the orange patch, which is bounded by the first median interspace and two black marginal spots in the angles of the outer half, upon interno-median interspace; these two spots are connected by a silvery-blue line; all the wings with a black marginal line; fringe snow-white, spotted with black. Body below snow-white; legs banded with black. Expanse of wings 1 inch 9 lines.

Ibara pass, Dewa, second week of July.

Coll. M. Fenton.

This on the under surface is one of the most beautiful of the true *Thecla*.

*THECLA ORSEDICE*, Butler.

♀. Upper surface much like the females of *Iolais pseudolonginus* and *Pithecopis intensa*. Primaries pale bluish grey, or greyish white, with very broad black-brown apical area and external border; median branches brackish; costal border pale bronzy brown, faintly shot with violet; fringe tipped with white: secondaries fuliginous brown, with the abdominal area and discoidal cell washed with pale ash-grey;



a slender snow-white submarginal line; fringe tipped with white; head somewhat olivaceous; body greyish; abdomen sordid brownish. Wings below pale shining dove-brown, with white submarginal line, white-tipped fringe; a disco-submarginal series of white-edged black spots and an irregular white-edged black discal line: primaries with the discal line straight from the third subcostal to the first median branch, where it is interrupted; the disco-submarginal spots subconical, almost orbicular, increasing in size from the costa to the external angle; internal border white: secondaries with the discal line near to the middle of the wing, oblique and terminating in a W-shaped character; the disco-submarginal spots lunate, the sixth interrupted by a large orange spot with black centre, and the seventh divided by an orange-and-black trifold streak which extends to the anal angle: body below white. Expanse of wings 1 inch 6 lines.

Iwashiro, second week in July.

Coll. M. Fenton.

Allied to *T. eretria* of Hewitson.

#### THECLA BUTLERI, Fenton.

Allied to *T. attilia*; colour the same; margin of primaries straighter. Above, the submarginal row of white spots in the secondaries larger and more distinct, the third, fourth, and the one near the anal angle centred with black: below, the ground-colour slightly duskier, becoming still more so towards the margin; in the primaries is a transverse bar in the middle of the cell, extending from the subcostal to the submedian vein, and almost divided by the median into two spots; the discal bar ceases abruptly at the third median veinlet; an extra small spot, just on the division between the middle and apical thirds, between the third median veinlet and the submedian vein: secondaries with a transverse row of three black spots at the base in a descending series from the costal vein, a short bar at the end of the cell as in primaries; a transverse irregular bar in the middle third, extending from the costal and narrowing towards the independent vein; a row of three oblong spots, the first two with the longer axis placed transversely, the third near the inner edge, almost at right angles to the second; a submarginal row of whitish spots centred with black, more distinct and enclosed in the aforesaid dusky colour; the orange-red at the base of the tail and at the anal angle more suffused. Expanse of wings 1 inch  $3\frac{1}{2}$  lines.

Middle of August.

Coll. M. Fenton.

On the top of the peak, 1060 feet high, overlooking Hakodaté, I took one specimen that had become involved in a circular wind eddying round the mountain and carried upwards in company with numbers of *Papilio hippocrates*, *Papilio maackii*, *Pieris megamera*, *Neope fentoni*, *Satyrus bipunctatus*, *Argynnis pallelescens*<sup>1</sup>, *Thecla japonica*, *Lycena ladonides*, and *Lycena hellotia*—all more or less shattered; some ascended still higher, until they were lost to view.

#### THECLA REGINA, Butler.

♀. Allied to *T. quercus* of Europe and *T. fasciata* of Japan. Pri-

<sup>1</sup> Possibly *A. locuples*.—A. G. B.

maries above with the basi-internal half, excepting the costal border and veins, bright cobalt-blue changing to ultramarine, the remainder of these wings dark shining cupreous-brown, the fringe tipped with white: secondaries cupreous-brown, paler than the primaries excepting towards the outer margin, fringe tipped with white: body greyish brown. Under surface with almost the pattern of *T. fasciata*, but greyer in tint and with all the markings sharply defined, the white stripe purer in colour, broader and more curved; the primaries with two slender submarginal whitish lines in continuation of the lunulated lines of the secondaries, and enclosing two distinct and a third indistinct blackish spot on the inferior half of the external area; orange spots of secondaries deeper in colour. Expanse of wings 1 inch 5 lines.

Toshima and Ihuri; July.

Coll. M. Fenton.

*T. regina* is of the usual size of *T. quercus*.

#### THECLA SIGNATA, Butler.

Allied to *T. arata* and *T. tyrianthina*. Primaries above with the discoidal cell, the interno-median interspace almost to outer margin, and the basal half of the median interspaces bright pure lilac, the remainder of the wing and the veins dark brown shot with lilac; secondaries rather pale fuliginous brown with bronzy reflections, the discoidal cell sprinkled with lilac scales. Wings below pale golden brown: primaries with two slightly darker spots in the cell, margined and partly connected by silvery-white lines; a slightly oblique band from costa to first median branch, edged on both sides with silvery-white lines; a submarginal series of indistinct white lunules, the last two of which bound two dusky spots; internal area shining whitish; fringe dusky: secondaries with two abbreviated silvery-white lines across the base of the subcostal area, the inner one curved; a nearly M-shaped character of the same colour crossed by the median vein; two widely angulated, slender, interrupted white lines from the abdominal margin to the median vein; an oblique white line from the costal margin to the first median branch, and a chain-like double white line from the apex to the second median branch; a large black spotted orange spot on the anal area (the anal third of the wing is ragged on both sides; but from what remains of the anal patch, it appears to be of the same character as that of *T. arata*). Body white, the venter creamy, the tarsi annulated with black. Expanse of wings 1 inch 3 lines.

Kuramatsumai, August.

Coll. M. Fenton.

*Thecla signata* may be placed between *T. arata* and *T. tyrianthina*, although in some respects very unlike either.

#### STRYMON FENTONI, Butler.

Nearly allied to *S. w-album* of Europe, but quite as large as *S. spini*; under surface like the latter species in tint, but with almost the pattern of *S. w-album*; the discal line of the primaries, however, is more arched and continuous, that of the secondaries is more transverse, and therefore does not run inwards in the direction of the base;

the submarginal spots are more dome-shaped, of a bright orange instead of red colour; and there is a distinct submarginal white line. Expanse of wings 1 inch 5 lines.

Shiribetsu, Hokkaido, August.

Coll. M. Fenton.

LEPTOSIA MORSEI, Fenton.

Allied to *L. amurensis*. Wings rounder, not produced at the apex; the black apical patch lighter: average expanse of *L. amurensis*, ♂ 1 inch 11½ lines, ♀ 2 inches ⅓ line; of *L. morsei*, ♂ 1 inch 11 lines, ♀ 2 inches.

Iburi, Hokkaido, end of July.

Colls. Fenton and B.M.

The example sent to us by Mr. Fenton certainly bears out the distinctions laid down in his above description; and I have little doubt that this is a genuine species.

PAPILIO DEHAANI, var. (?) TUTANUS, Fenton.

♂. Primaries sharper above than typical *P. dehaani*; the scattered atoms are slightly brighter and greener<sup>1</sup> and are aggregated in a transverse discal bar: below, the broad whitish discal dash of the primaries of *P. dehaani* much narrower and less distinct, and obsolete in some specimens; the scattered ochreous scales of the secondaries are somewhat paler and are aggregated (densely in some examples) in a curved transverse discal bar; the violet scales over-arching the red submarginal lunules more numerous. There is the same difference between the sexes; both sexes vary in a like degree *inter se*. Generally larger. Expanse of wings, ♂ 4 inches 8 lines to 5 inches 6 lines; ♀ 5 inches 6 lines to 5 inches 9 lines.

Toshima and Iburi, Hokkaido.

Colls. Fenton and B.M.

The summer brood makes its first appearance about the 26th of July, and is on the wing till the middle of September.

*P. tutanus* and *P. dehaani*<sup>2</sup>, near Hakodaté, in the south of Hokkaido, are found feeding together on the same excrement, though I never saw the males of the latter in conflict with those of *P. tutanus*, or chasing the females, or *vice versa*. Further north I did not see a single specimen of *P. dehaani*, and *P. tutanus* became more abundant.

The following *Lycaenid* was unwittingly omitted from my descriptions of new species from Nikko.

AMBLYPODIA TURBATA, sp. n.

♂. Form and size of *A. diardi*; but the secondaries comparatively rather larger, the wings above dark blue instead of violet, and with a rather broad black external border: under surface more like *A. apidanus* in pattern and coloration, but the costal thirds of all the wings washed with lilac, across which the olive-brown bands run;

<sup>1</sup> The colour was noted before the specimens were transferred to the cabinet. The fumes of carbolic acid, present in the drawers, turn them very green.

<sup>2</sup> The species sent home by Mr. Fenton under this name is *P. maackii*; and therefore, excepting in this description (which characterizes what I believe to be a distinct species much nearer to the true *P. dehaani*), I have corrected Mr. Fenton's name.—A. G. B.

the abdominal half of secondaries crossed by three irregularly arched nebulous blackish bands, increasing in intensity and in extent as they approach the outer margin; the basal area also ashy instead of dark brown, and the markings on the basal half of the primaries small and more feebly indicated than those of the external half. Expanse of wings 1 inch 11 lines.

♀. Primaries above bright ultramarine, with a very broad black apical area and external border; secondaries and body blackish brown; wings below more like *A. centaurus* than the male, the arched abdominal bands obsolete, replaced by a continuation of the ordinary pale-edged macular bands. Expanse of wings 1 inch 11 lines.

Six examples, Nikko (*C. Maries*).

Coll. B.M.

*PROTEIDES CHRYSÆGLIA*, sp. n.

Olivaceous brown, the wings with bright golden or yellowish cupreous reflections, and with the basal three fourths densely sprinkled with fulvous hair-like scales; fringe creamy whitish: primaries with an indication of four or five increasing oval discal buff-coloured spots, which, however, are concealed in certain lights by the shot colouring of the wing: head bright fulvous; thorax densely clothed with fulvous hair; palpi jet-black with a broad yellow band. Under surface olivaceous, with slight golden reflections: primaries with the pale buff spots distinct, forming a pyramidal patch, the base of which is expanded and occupies the whole internal border, divided by the median branches; a small bifid yellow spot within the end of the cell, and a few radiating scales of this colour beyond the cell; secondaries with yellowish abdominal area: tibiae and tarsi bright orange. Expanse of wings 1 inch 10 lines.

Four examples, Yesso (*C. Maries*).

Coll. B. M.

## 9. On the Butterflies of Amurland, North China, and Japan.

By H. J. ELWES, F.L.S., F.Z.S.

[Received November 15, 1881].

Our knowledge of the Lepidoptera of N.E. Asia has received large accessions during the last few years; but no attempt has yet been made to enumerate the Butterflies which are found there. It is still far too soon to do this with any thing like completeness, as we know nothing of the insects of China except in a few scattered localities; and when we consider the enormous extent of the country, and the number of years required by so indefatigable a naturalist as the late Mr. Swinhoe to gain a fair knowledge of the birds, it is evident that a good list of the Chinese Butterflies must be for many years impossible. Having recently been requested by Mr. Godman to work up a collection made in China by Mr. Pryer, I soon found that the relation between the Butterflies of North China, Amurland, and Japan was so close that they could only be studied as a whole.

The materials at hand for this purpose were the extensive collections formed by Messrs. Jonas, Pryer, and Fenton in Japan, nearly complete series of which, received through Mr. Janson, are in Mr. Godman's and my own collections. I also received from Dr. Staudinger a nearly complete series of the Amurland Butterflies collected by Christoph; and from Askold I had a majority of the species collected by Jankowsky. In Mr. Godman's collection are also a number of rare species from Amurland. I have further consulted, as far as my time and opportunities allowed, the British-Museum and Hewitson collections. Lastly, and most important of all, I had through Dr. Staudinger's kindness an opportunity of comparing most of the doubtful Japanese forms with specimens in his unrivalled collection, which contains long series of nearly all the species known in Amurland. I do not propose, however, to treat of these in detail, as I hope that they may be shortly monographed in a thorough and complete manner by Dr. Staudinger himself.

The large number of new species which have been recently described from Japan by Mr. Butler, would no doubt lead one to suppose that the fauna of that country was an extremely peculiar one. Knowing beforehand that the birds and plants of Japan have a very close affinity with those of Eastern Asia and Europe, I was not surprised to find that many of these new species were really only varieties of well-known European insects; and the more I studied them, the more convinced I became that a better knowledge of the Japanese Butterflies will confirm my views. Many Japanese insects which at first seemed distinct, proved, on comparison with a really fine Palæarctic collection, which unfortunately does not exist in England, to be at best local forms of them; and the remarkable variations which exist among them tend to prove this. It is, however, as yet impossible to speak with certainty about many of these species, which have been described from single, faded, and imperfect specimens, or even in some cases from drawings; and until the distribution, variations, and conditions of life under which these varieties are produced have been studied on the spot by a competent naturalist well acquainted with the Palæarctic Lepidoptera, any conclusions on the question must be doubtful. The time has gone by when species could be described wholesale without comparison with the allied forms in neighbouring regions; and for this reason I venture to think that such bare descriptions as have been published in various periodicals are not calculated to advance scientific knowledge.

The literature of the Lepidoptera of these countries is extremely scattered and imperfect: with the exception of Bremer's and Ménétrés's lists of the Lepidoptera of Amurland, no extensive papers have been published; and at the time these papers were written Japanese Lepidoptera were unknown.

The most important papers are as follows:—

BREMER & GREY. Beiträge zur Schmetterlings-Fauna der nördlichen China. St. Petersburg, 1853.

Contains a list of species collected near Pekin by Tatarinoff

and Gaschkevitch, with 2 plates. The remaining novelties in this collection are figured by  
**MÉNÉTRIÉS.** *Enumeratio Corporum Animalium Musei Imp. Petropoli.* St. Petersburg, 1863.

Quoted as *Cat. Mus. Petr.*

**BREMER.** *Lepidopteren Ost-Sibiriens.* *Mém. Acad. Imp. Sciences de St. Pétersbourg*, 1864.

Published as a separate paper, and contains a very full list of the Amur Lepidoptera collected by Radde, Maack, and Wulffius, with 8 plates, 4to, and descriptions of many species.

**MÉNÉTRIÉS.** *Lépidoptères de la Sibirie orientale* (Schrenk's Amur. *Reise*, vol. ii.). St. Petersburg, 1859.

Contains a full list of the collections made by von Schrenk and Maack in Amurland and Eastern Siberia, with notes on their geographical distribution and descriptions of new species, many of which are figured on five 4to plates. Quoted as *Mén. Schrenk's Reise*.

This paper is so lettered in the French edition, which appears to have been published in *Mélanges biol. Acad. St. Pétersbourg*, 1859, vol. i.

**FELDER.** *Wiener entomologische Monatschrift*, vol. vi. Vienna, 1862.

Contains a list of species collected at Ningpo by Dr. Muirhead, with several descriptions of new species.

**OBERTHÜR.** *Etudes d'Entomologie.* Livraison ii. 1876. Rennes.

Contains descriptions, with beautifully executed figures, of some of the most interesting species collected by the Abbé David in Western and Northern China.

**OBERTHÜR.** *Etudes d'Ent.* Livraison v. 1880.

Contains an account of the collection made by Jankowsky at Askold, an island on the coast of Amurland near Vladivostock, with descriptions and beautiful plates of new species.

**MOTSCHULSKY.** *Etudes Entomologiques.* Neuvième année, 1860. Helsingfors.

Contains an account of a small collection made by Madame Gaschkevitch in Japan, and description of 5 species.

**DE L'ORZA.** *Les Lépidoptères japonais à la Grande Exposition Internationale de 1867.* Rennes, 1869.

Contains a list of 75 species, many of which are either wrongly identified, or have not been sent from Japan since, and descriptions of some new species.

Besides these separate publications there are a number of scattered descriptions in various periodicals, the most important of which are:—

**MURRAY.** *Notes on Japanese Butterflies, with Descriptions of new Genera and Species.* *Entomologist's Monthly Magazine*, Dec. 1874.

Contains an account of H. Pryer's Yokohama collection.

MURRAY. List of Japanese Butterflies. Ent. Mo. Mag. July 1876, p. 33.

A compilation from various sources, in which Mr. Murray shows that he shares my views as to the validity of many of Mr. Butler's species.

W. B. PRYER. List of Rhopalocera of the Chekiang and Kiangsoo provinces, China. Ent. Mo. Mag. Aug. 1877.

A list of 86 species, with an account of a visit to the Snowy Valley near Ningpo, where many new species were found. The novelties in this collection were described partly by Butler and partly by Moore. The collection, with many additional species from other parts of China, is now in Mr. Godman's museum.

BUTLER. Journal of the Linnean Society, Zool. vol. ix. p. 50. 1862.

A list of the Diurnal Lepidoptera collected by Mr. Whitely at Hakodadi.

BUTLER. Cistula Entomologica, vol. ii. p. 281 (June 1878).

On Butterflies from Japan collected by Mr. Fenton. Describes several new species.

BUTLER. Annals and Magazine of Natural History, ser. 5, vii. (March 1881).

Describes a number of new species, and gives a list of 130 species collected by Maries in the district of Nikko, Japan, now in the British Museum.

O. JANSON. Cistula Entomologica, vol. ii. p. 153 (May 1877).

Describes the new species in Mr. Jonas's collection, of which a complete set is now in Mr. Godman's museum.

O. JANSON. Cist. Ent. vol. ii. p. 269 (June 1878).

Remarks on Japanese Butterflies, and descriptions of five new species figured on plate 5 (uncoloured).

With regard to the geographical limits of this paper, I have determined to exclude Southern and Western China—the first because its climate and fauna is tropical rather than palæarctic, and because our knowledge of the Butterflies is infinitesimal. It is extraordinary that out of the great number of Englishmen who for nearly a century have resided at various ports on the coast of China, not one has ever studied Lepidoptera scientifically, and no traveller has ever collected more than a few specimens in any one place, so far as I am aware. Nearly as much was known by Donovan 90 years ago of the insects of South China as we know now; and there is perhaps hardly another place in the world of equal interest and with half the facilities for travel which has been so much neglected by naturalists. Of Western China we know nothing except from the travels of that excellent and intrepid naturalist the Abbé David. It is much to be deplored that his extensive collections of insects have lain unnoticed for so long in Paris. M. Oberthür, of Reunes, has done much to give an idea of their novelty and interest. It is evident, however, that this fauna must be studied in connexion with that of Sikkim,

with which, as I have shown in Proc. Zool. Soc. 1873, p. 645 *et seq.*, it is so intimately connected.

The same remark applies to Formosa, which I have also excluded. Of the Butterflies of North China we know almost nothing; but the little we know shows what a rich harvest is to be reaped there by a collector. The countries between China proper and Amurland are *terrae incognitæ*; but Amurland itself has been recently well worked by several good entomologists: Messrs. Christoph, Dörries, Jankowsky, and Hedemann have all collected largely in various localities, from the Schilka river on the Upper Amur, down to Blagovestchensk, Raddefskaia or Raddefka, and Khabarofka, all of which are situated on the main stream. The Bureija Mountains north of the river also yielded a rich collection to Radde; but do not seem to have been revisited. That part of the river which lies between the junction of the Ussuri at Khabarofka and Nikolaiefsk at the mouth of the Amur does not seem to have been much worked, the climate becoming much more severe on the north-east coast.

The southern part of the maritime province near Vladivostock and the island of Askold seems to have many species not occurring on the Amur which were previously only known from Japan; and it is probable that the insects of Corea are very similar. An account of Christoph's journey, giving interesting particulars of the country, is published in the 'Stettiner entomologische Zeitung' for 1870, pp. 201 and 401. I have included one or two species which seem to occur only on the Sea of Ochotsk to the northward of Amurland proper; but very little is known of that region or of the great island of Saghalien.

The only part of Japan which seems to have been at all thoroughly worked by lepidopterists is the neighbourhood of Tokio and Yokohama; and in most cases no exact indication of locality is given for Japanese insects. Of the great southern islands of Sikok and Kiusiu little or nothing is known, though it is possible that some of De l'Orza's species came from there. The climate of Southern and Central Japan is so different from that of the north, that the large proportion of species of Indian affinity which is found there can be easily accounted for; and when we consider the great extent of mountainous unexplored country, it is clear that much must be done before any thing like a good account of the Lepidoptera of Japan can be given.

The climate of N. China and Amurland is generally very cold in winter, the Peiho and Amur rivers being closed by ice for several months. In the summer it is warm and wet on the coast region, but much drier in the interior, especially in the north of China and Manchuria. South of Shanghai the winter becomes so much milder that tropical forms of animal and vegetable life rapidly take the place of temperate ones; but some species of thoroughly tropical affinities and appearance extend far into North-eastern Asia and Japan, in the same way that some tropical birds migrate to Amurland and North China during the breeding-season.

In this paper I have taken the genera for the most part as I found



them, without attempting to study the generic affinities of the species, as this would be a work beyond my time or power. With respect to the species described by old authors, I have also as a rule accepted the verifications of previous writers, believing that when a species is well known under any name it is better to adhere to it than, for the sake of a few years' priority, to make a change, founded as such changes must often be on very doubtful identifications of descriptions. In many genera, such as *Colias*, *Argynnis*, or *Lycana*, the best descriptions by modern authors are of very little use in making out doubtful species; how much more, then, must it be the case when old authors are referred to. Only good figures or the examination of the type specimens can really be depended on; and even then doubts will often crop up as to what the insects are. For instance, who could follow Mr. Butler's descriptions of species of *Terias* in the Trans. Ent. Soc. 1880, p. 198, without the plates? and who could form an opinion of the species of Japanese *Colias* from descriptions, however elaborate, of such species as *C. elwesi*, *C. pallens*, or *C. subaurata*? With regard to the species included in Staudinger's Catalogue, I have adopted his nomenclature, as I believe that it is as nearly accurate as such a work can possibly be made, and it is generally adopted by European lepidopterists. There must be numerous errors in my work, especially as regards the Hesperidæ, inseparable from a paper which cannot be written at home with the whole of the specimens before one, but must be put together from notes often taken under circumstances unfavourable to accuracy. For these errors and for errors of judgment I beg the indulgence of those who may have occasion to refer to my work; and I assure them, that if any of my conclusions are faulty, as undoubtedly some must be, I have endeavoured to put together the scattered materials at my disposal with a regard for scientific truth only, and not with any wish to throw discredit on the observations of others. Finally, I must express my thanks to Mr. Godman and Dr. Staudinger for the great facilities which they have given me in examining their collections (from every point of view the two best in the world), and to Messrs. Kirby and Butler, of the British Museum, whose time I have so often taken up in a manner which I think most unreasonable, but which under the present regulations of the Museum is unavoidable.

On making an analysis of the distribution of the species I get the following results, which, though they must be considered as approximate only, will, I believe, give a very fair idea of the character of the Butterflies in each country.

#### AMURLAND.

Species common to and characteristic of the Palearctic region	85
Peculiar to the Eastern part of the region, but mostly of Palearctic genera	80
Belonging to genera characteristic of the Indian region, or cosmopolitan in Old World	10

Common to Amurland and Japan, 78.

## CHINA.

Species common to and characteristic of the Palæarctic region.....	22
Peculiar to the Eastern part of this region, but mostly belonging to genera of Palæarctic affinity .....	46
Belonging to genera characteristic of the Indian region, or cosmopolitan in Old World .....	68
Common to China and Japan, 67.	136

## JAPAN.

Species common to and characteristic of the Palæarctic region.....	41
Peculiar to the Eastern part of this region, but mostly belonging to genera of Palæarctic affinity .....	62
Common to Indian region, or cosmopolitan in Old World..	44
Common to Amurland, China, and Japan, 33.	147

The genera peculiar to the Eastern Palæarctic region are :—

*Sericinus*. Allied to *Thais*?, containing 2 or 3 species peculiar to North China.

*Lühdorfia*. Allied to *Thais*, containing 1 species found in the coast-region of South Amurland, China, and ?Japan.

*Paraplesia*. A monotypic genus of Nymphalidæ, peculiar to the Ningpo hills.

Genus novum?, allied to *Argynnis* and *Melitæa*, peculiar to North China, 1 species (*A. maculata*).

*Palæonympha*. A monotypic genus of Satyridæ, peculiar to the Ningpo hills.

*Satsuma*. A section of *Thecla*, containing 1 species in Amurland and Japan, allied to N.-American insects.

*Niphanda*. A genus of uncertain affinity; 1 species in Amurland, China, and Japan.

Genera common to and characteristic of the Palæarctic Region :—

*Parnassius*. 7 species, of which only one occurs in Japan, and none are as yet known in North China, though it doubtless occurs there.

*Colias*. 4 or 5 species, in Amurland and Japan.

*Anthocharis*. 3 species, of which one, allied to a Californian species, occurs in Japan and China, one in Amurland, and one in China.

*Aporia*. 1 species in Japan, and 1 peculiar to Amurland.

*Leucophasia*. 1 or 2 species in Amurland, Japan, and China. Only one other known species of the genus exists, which is local in Europe.

*Gonepteryx*. 1 or 2 species in Amurland, Japan, and China.

*Polyommatus*. 4 species, of which 3 are confined to Amurland, one also in Japan and China.

*Arge*. 1 species confined to Amurland and China.

*Argynnis*. Many species in Amurland, Japan, and China.

*Melitæa*. Several species in Amurland, 2 of which extend to Japan, but only 1 to China.

*Erebia*. Several species in Amurland, of which one extends to Japan, but none are known in China.

*Satyrus*. Only 1 species in Amurland and Japan.

*Epinephele*. 1 species only in Amurland and Japan.

*Ceanonympha*. 4 species, of which one or two extend to Japan and China.

*Triphysa*. 1, or perhaps 2, species in Amurland, and probably Japan.

*Æneis*. 4 species in Amurland and China.

Genera common to and characteristic of the Himalayan subregion :—

A section of *Thecla* represented by *T. smaragdina*. 4 species in Amurland and Japan.

*Lethe*. 5 or 6 species in Amurland, Japan, and China.

*Neope*. 2 or 3 species in Japan and China.

With regard to the Hesperidæ, I think it better to omit the genera when considering questions of geographical distribution. Many of them are so obscure and apparently so much more cosmopolitan than other families, that it is difficult to base sound ideas upon them. Speaking generally, however, I may say that *Ismene*, represented by three species in China, Japan, and Amurland, is of Indian affinity. *Nisoniades* is represented by one species only, common to Amurland, China, and Japan, which comes closest to N.-American species.

In the southern part of our limits the largest proportion of the Hesperidæ are tropical, whilst in Amurland they nearly resemble European species or are of more or less peculiar forms. Generally the family is well represented in all parts of the region.

#### GEOGRAPHICAL DISTRIBUTION OF BUTTERFLIES IN N.E. ASIA.

Species.	Amurland.	China.	Japan.	General.
PAPILIONIDÆ.				
<i>Papilio machaon</i> .....	*	* (var. asiatica.)	* (var. hippocrates.) (var. asiatica.)	Palaearctic & Nearctic regions.
<i>xuthus</i> .....	*	*	*	India, South China.
<i>bianor</i> .....	.....	*	.....	
<i>maacki</i> .....	*	*	*	
<i>dehaani</i> .....	.....	.....	*	
<i>protenor</i> .....	.....	*	.....	
<i>demetrius</i> .....	.....	*	*	
<i>macilentus</i> .....	.....	*	*	
<i>alcinous</i> .....	.....	.....	*	
<i>mencius</i> .....	.....	*	*	

*Geographical Table (continued).*

Species.	Amurland.	China.	Japan.	General.
<i>PAPILIONIDÆ (continued).</i>				
<i>Papilio aristolochiæ</i> ...	.....	*	.....	India &c.
<i>panmon</i> .....	.....	*	*	India, S. China, &c.
<i>helenus</i> .....	.....	.....	*	do.
<i>memnon</i> .....	.....	.....	*	do.
<i>sarpedon</i> .....	.....	*	*	India &c.
<i>agamemnon</i> .....	.....	*	*?	do.
<i>erithonius</i> .....	.....	*	.....	do.
<i>alebion</i> .....	.....	*		
<i>marici</i> .....	.....	*		
<i>Sericius telamon</i> ...	.....	*		
<i>telmona</i> .....	.....	*		
<i>Lühdorffia puziloi</i> .....	*	*?	*?	
	(Coast-region only.)			
<i>Parnassius nomion</i> ...	*	.....	.....	Siberia.
<i>tenedius</i> .....	*			
<i>eversmanni</i> .....	*	.....	.....	Alaska.
	(North-east only.)			
<i>bremeri</i> .....	*			
<i>felderi</i> .....	*			
<i>stubbendorff</i> .....	*			
<i>glacialis</i> .....	.....	.....	*	
<i>PIERIDÆ.</i>				
<i>Aporia crategi</i> .....	*	.....	*	Europe; N. Asia.
<i>hippia</i> .....	*			
<i>Pieris brassicæ</i> , var.				
<i>crucivora</i> .....	*	*	*	
<i>melete</i> .....	*	*?	*	
<i>napi</i> .....	*	.....	*	Palaearctic & Neartic.
<i>daphidice</i> .....	*	*	.....	Palaearctic.
<i>glieiria</i> .....	.....	*	.....	India, S. China.
<i>Anthocharis scolymus</i> .	.....	*	*	
<i>bambusarum</i> .....	.....	*		
<i>cardamines</i> .....	*	.....	.....	Palaearctic.
<i>Leucophasia sinapis</i> ...	*	.....	*	do.
var. <i>amurensis</i> .	*	*	*	
<i>Rhodocera rhamni</i> ...	*	*	*	Palaearctic.
var. <i>aspasia</i> ...	*	.....	*	
<i>Colias palteno</i> .....	*	.....	*	Arctic regions generally.
<i>hyale</i> .....	*	*	*	Palaearctic.
<i>melinos</i> .....	*			
<i>aurora</i> .....	*			
? <i>Colias erate</i> .....	*?	.....	*?	
<i>Terias hecabe</i> .....	.....	*	*	Indian region, &c.
<i>lata</i> , var. <i>jageri</i> ...	.....	*	*	India, &c.
<i>bethesba</i> .....	.....	.....	*	
<i>anemone</i> .....	.....	*	*	
<i>mandarina</i> .....	.....	.....	*	

*Geographical Table (continued).*

Species.	Amurland.	China.	Japan.	General.
<i>LYCENIDÆ.</i>				
<i>Miletus hamada</i> .....	.....	*	*	Sikkim?
<i>Lampides?</i> , sp. ....	.....	*		
<i>Lycæna?</i> , sp. nova ...	.....	.....	*	
<i>Curetis acuta</i> .....	.....	*	*	
<i>truncata</i> .....	.....	*		
<i>Amblypodia japonica</i> .	.....	.....	*	
<i>turbata</i> .....	.....	.....	*	
<i>Niphanda fusca</i> .....	*	*	*	
<i>Dipsas lutea</i> .....	*)	.....	*	} Found only in the lit- toral pro- vinces.
<i>sapistrata</i> .....	*)	.....	*	
<i>jonasi</i> .....	*)	.....	*	
<i>raphaelis</i> .....	*)			
<i>michaelis</i> .....	*)			
<i>Thecla smaragdina</i> ...	*	*	*	
<i>japonica</i> .....	*	.....	*	
<i>orientalis</i> .....	*	.....	*	
<i>saphirina</i> .....	*			
<i>cærulea</i> .....	.....	*		
<i>avidicna</i> .....	.....	*		
<i>micans</i> .....	.....	*		
<i>arata</i> .....	*	*	*	
<i>attilia</i> .....	*	.....	*	
<i>enthea</i> .....	*	.....	*	
<i>w-album?</i> .....	.....	*	.....	Palearctic region.
<i>grandis</i> .....	.....	*		
<i>spini?</i> .....	.....	*?	*?	
<i>pruni</i> .....	*	.....	.....	Palearctic region.
<i>mera</i> .....	.....	.....	*	
<i>prunoides</i> .....	*			
<i>phyllodendri</i> .....	*			
<i>rubi</i> .....	*	.....	*?	Palearctic & Nearctic.
<i>Satsuma?</i> <i>fridvalskyi</i> .	*	.....	*) ( <i>ferrea</i> )	
<i>Polygonmatus phlaeas</i> .	*	*	*	Palearctic & Nearctic.
<i>virgaureæ</i> .....	*	.....	.....	Palearctic.
<i>amphidamas</i> .....	*	.....	.....	do.
<i>hippotoch</i> .....	*	.....	.....	do.
<i>Lycæna batia</i> .....	.....	*	*	Palearctic & Indian regions.
<i>argiades</i> .....	*	*	*	Palearctic & Nearctic.
<i>fischeri</i> .....	*	*	.....	Siberia.
<i>argia</i> .....	*	*	*	India, S. China, &c.
<i>lysion</i> .....	.....	*	*?	India, S. Europe.
<i>cleobis</i> .....	*			
<i>argus</i> .....	*	*	*	Palearctic & Nearctic.
<i>ægon</i> .....	*	.....	*	Palearctic region.
<i>orion</i> .....	*	*	.....	do.
<i>baton</i> .....	*	.....	.....	do.
<i>astrarche</i> .....	*	.....	.....	do.
<i>icarus</i> .....	*?	.....	.....	do.
<i>eros</i> .....	*?	.....	.....	do.
<i>amanda</i> .....	*	.....	.....	do.
<i>eumedon</i> .....	*	.....	.....	do.

*Geographical Table (continued).*

Species.	Amurland.	China.	Japan.	General.
<i>LYCENIDÆ (continued).</i>				
<i>Lycena biton</i> .....	*		*	Palaearctic region.
<i>argiolus</i> .....	*	*		do.
<i>minima</i> .....	*	.....	.....	do.
<i>semiargus</i> .....	*	.....	.....	do.
<i>cyllarus</i> .....	*	.....	.....	do.
<i>lycornus</i> .....	*	.....	*	
<i>arionides</i> .....	*	.....	*	
<i>arion</i> .....	*	.....	.....	Palaearctic region.
<i>pryeri</i> .....	*	.....	*	
<i>euphemus</i> .....	*	.....	*	Palaearctic region.
<i>LEMONIIDÆ.</i>				
<i>Libythea lepita</i> .....	.....	.....	*	Himalaya.
<i>Zemeros flegyas</i> .....	.....	*	.....	Indian region.
<i>NYMPHALIDÆ.</i>				
<i>Charaxes narceus</i> .....	.....	*		
<i>Dichorragia nesina-</i> <i>chus</i> .....	.....	.....	*	Himalaya.
<i>Apatura iris</i> .....	*	.....	.....	Palaearctic region.
<i>ilia</i> .....	*	*	*	do.
<i>Euripus charonda</i> .....	.....	.....	*	
<i>japonica</i> .....	.....	.....	*	
<i>Adolias ? schrenki</i> .....	*			
<i>Hestina assimilis</i> .....	.....	.....	*	India.
<i>Paraplesia adelma</i> .....	.....	*	.....	Genus peculiar to
<i>Athyma sulpitia</i> .....	.....	*		China.
<i>pryeri</i> .....	.....	*		
<i>Limenitis nycteis</i> .....	*			
<i>populi</i> .....	*			
<i>sydyi</i> .....	.....	.....	*?	Siberia.
<i>var. latifasciata</i>	*			
<i>amphyssa</i> .....	*	.....	*?	
<i>helmanni</i> .....	*	.....	*?	Siberia.
<i>? var. homeyeri.</i>	*			
<i>sibilla</i> .....	*	.....	*	Palaearctic region.
<i>sinensium</i> .....	.....	*		
<i>Neptis ? raddei</i> .....	*			
<i>Neptis thisbe</i> .....	*			
<i>philyra</i> .....	*			
<i>var. ? speyeri</i> .....	*			
<i>philyroides</i> .....	*			
<i>aceris</i> .....	*	*	*	Palaearctic & Indian
<i>lucilla</i> .....	*	.....	*	regions.
<i>pryeri</i> .....	*	*	*	Palaearctic region.
<i>sangaica</i> .....	.....	*		
<i>eurynome</i> .....	.....	*		
<i>alwina</i> .....	.....	*		
<i>excellens ?</i> .....	.....	.....	*	
<i>Junonia lemonias</i> .....	.....	*?	*?	Indian region.

## Geographical Table (continued).

Species.	Amurland.	China.	Japan.	General.
<i>NYMPHALIDÆ (continued).</i>				
<i>Junonia almana</i> .....	.....	*	.....	Indian region.
<i>asteria</i> .....	.....	*	.....	do.
<i>orithya</i> .....	.....	.....	*?	do.
<i>Vanessa levana</i> .....	*	*	*	Palearctic region.
<i>burejana</i> .....	*	.....	*	Palearctic & Nearctic.
<i>l-album</i> .....	*	.....	*	do.
<i>c-album</i> .....	*	.....	*	N. Asia, E. Europe.
<i>xanthomelas</i> .....	*	*	*	Palearctic region.
<i>urticæ</i> .....	*	.....	*	do.
<i>io</i> .....	*	.....	*	Palearctic & Nearctic.
<i>antiopa</i> .....	*	.....	*	General.
<i>cardui</i> .....	*	*	*	
<i>c-aureum</i> .....	.....	*	*	
<i>pryeri</i> .....	.....	*	*	
<i>callirhoë</i> .....	*	*	*	Asia.
<i>charonia</i> .....	.....	*	*	do.
<i>Melitæa maturna</i> .....	*	.....	.....	Palearctic region.
<i>aurinia</i> .....	*	.....	.....	do.
<i>didyma</i> .....	*	.....	*?	do.
<i>dictynna</i> .....	*	.....	.....	do.
<i>arcesia</i> .....	*	.....	.....	
<i>phœbe</i> .....	*	*	*	
<i>trivia</i> .....	*	.....	.....	Palearctic region.
<i>athalia</i> .....	*	.....	*	do.
<i>aurelia</i> .....	*	.....	.....	do.
<i>plotina</i> .....	*	.....	.....	
<i>Argynnis ? maculata</i> ..	.....	*	.....	Genus peculiar to N. China.
<i>Argynnis niphe</i> .....	.....	*	*	India.
<i>childreni</i> .....	.....	*	.....	do.
<i>selenis</i> .....	*	.....	.....	Palearctic region.
<i>selene</i> .....	*	.....	.....	
<i>oscarus</i> .....	*	.....	.....	
<i>angarensis</i> .....	*	.....	.....	
<i>sp. nova ?</i> .....	.....	.....	*	
<i>freijs</i> .....	*	.....	.....	Arctic regions.
<i>thore</i> .....	*	.....	.....	Europe & Asia.
<i>daphne</i> .....	*	*	*	Palearctic region.
<i>ino</i> .....	*	.....	.....	do.
<i>aglaia</i> .....	*	.....	*	do.
<i>adippe</i> .....	*	*	*	do.
<i>var. ? nerippe</i> ..	.....	*	*	
<i>anadyomene</i> .....	*	*	*	
<i>sagana</i> .....	*	*	*	
<i>paphia</i> .....	*	.....	*	Palearctic region.
<i>laodice</i> .....	*	*	*	Asia & E. Europe.
<i>ruslana</i> .....	*	.....	*	
<i>DANAIDÆ.</i>				
<i>Danais tytia</i> .....	*	*	*	Himalayas.
<i>chrysippus</i> .....	.....	*	*	General.

*Geographical Table (continued).*

Species.	Amurland.	China.	Japan.	General.
<b>MORPHIDÆ.</b>				
<i>Thaumantis howqua</i> ..	.....	*		
<b>SATYRIDÆ.</b>				
<i>Melanargia halimede</i> ..	*			
var. <i>meridionalis</i> ..	.....	*		
<i>Debis europa</i> ..	.....	*	.....	Indian region.
<i>Melanitis leda</i> ..	.....	*?	*	do.
<i>Mycalesis gotama</i> ..	.....	*	*	
perdicæ ..	.....	*	*	
<i>Ypthima baldus</i> ..	*	*	*	
<i>motschulskyi</i> ..	*	*	*	Himalayas.
<i>zodia</i> ..	.....	*	*	
<i>megalomma</i> ..	.....	*		
<i>Palæonymphe opalina</i> ..	.....	*	.....	Genus peculiar to China.
<i>Erebia medusa</i> ..	*	.....	.....	Palaearctic region.
parmenio ..	*			
sedakovii ..	*	.....	*	
cyclopius ..	*			
tristis ..	*			
discoidalis ..	*	.....	.....	Arctic America.
saxicola ..	(North coast only.)	*		
ero ..	*			
edda ..	*			
ajanensis ..	*			
embla ..	(Coast-region.)			
	(North coast.)	.....	.....	Arctic regions, Old World.
<i>Eneis sculda</i> ..	*			
jutta ..	*	.....	.....	Arctic regions, Old World.
urda ..	*			
mongolica ..	.....	*		
<i>Satyrus dryas</i> ..	*	.....	*	Palaearctic region.
<i>Pararge æhine</i> ..	*	.....	*	do. <sup>a</sup>
deidamia ..	*	*	*	
<i>Pararge? manckii</i> ..	*	.....	*	
<i>Epinephelo hyperanthus</i> ..	*	.....	*?	Palaearctic region.
<i>Lasiommata (Lethe?) bremeri</i> ..	.....	*		
syræis ..	.....	*		
lanaris ..	.....	*		
satyrina ..	.....	*		
epimenides ..	*	.....	*	
var. <i>epaminondas</i> ..	*			
sicelis ..	.....	*	*	
schrenkii ..	*	.....	*	
diana ..	.....	.....	*	
whitelyi ..	.....	.....	*	
<i>Neope gaschkewitschii</i> ..	.....	*?	*	



## Geographical Table (continued).

Species.	Amurland.	China.	Japan.	General.
<i>SATYRIDÆ (continued).</i>				
<i>Neope ? calipteris</i> .....	.....	.....	*	
<i>Neope ? muirheadi</i> ...	.....	*		
<i>Triphysa nervosa</i> .....	.....	.....	*	
var. ? <i>albovenosa</i> .	*			
<i>Ctenonympha cædipus</i> ..	*	.....	*	Palaearctic region.
<i>amaryllis</i> .....	*	*	.....	do.
<i>hero</i> .....	*	.....	.....	do.
<i>iphis</i> .....	*	.....	.....	do.
<i>HESPERIDÆ.</i>				
<i>Casyapa thrax</i> .....	.....	*	.....	Indian region.
<i>Tagiades nymphalis</i> ...	*	*		
<i>Ismene benjaminii</i> .....	.....	*	*	Himalayas.
<i>septentrionalis</i> ...	.....	*		
<i>aquilina</i> .....	*	.....	*	
<i>Hesperia ? alexis</i> .....	.....	*		
<i>Plesioneura curvi-</i>				
<i>fascia</i> .....	.....	*		
<i>bifasciata</i> .....	.....	*		
<i>Plesioneura ? phodiceus</i>	.....	*		
<i>Pterygospidea macu-</i>				
<i>losa</i> .....	.....	*		
<i>sinica</i> .....	.....	*	*	
<i>Daimio tothys</i> .....	*	*	*	
<i>Antigonus vasava</i> ....	.....	*	??	Himalayas.
<i>Pamphila mendica</i> .....	.....	*		
<i>sinensis ?</i> .....	.....	*		
<i>mathias</i> .....	.....	*	*	
<i>oceia</i> .....	.....	*		
<i>lamprospilus</i> .....	.....	*	*	
<i>varia</i> .....	.....	.....	*	
<i>guttata</i> .....	.....	*	*	
<i>fortunei ?</i> .....	.....	*		
<i>pellucida</i> .....	.....	.....	*	
<i>jansonis ?</i> .....	.....	.....	*	
<i>Pamphila ? confucius</i> ..	.....	*		
<i>Hesperia sylvanus</i> ...	*	*	*	Palaearctic region.
<i>comma</i> .....	*	.....	*	do.
<i>sylvatica</i> .....	*	.....	*	
<i>leonina ?</i> .....	.....	.....	*	
<i>ochracea</i> .....	*	.....	*	
<i>rikuchina ?</i> .....	.....	.....	*	
<i>lincola</i> .....	*			
<i>Hesperia ? flava</i> .....	.....	*	*	
<i>Hesperia ? maro</i> .....	.....	*	.....	Palaearctic region.
<i>Carterocephalus palam-</i>				
<i>mon</i> .....	*	.....	.....	do.
<i>sylvius</i> .....	*	.....	.....	do.
<i>argyrostigma</i> .....	*			
<i>Cyclopides morpheus</i> ..	*	.....	.....	Palaearctic region.
<i>ornatus</i> .....	*			
<i>unicolor</i> .....	.....	*	*	

*Geographical Table (continued).*

Species.	Amurland.	China.	Japan.	General.
<i>HESPERIDÆ (continued).</i>				
<i>Pyrgus inachus</i> .....	*	*?	*	Palearctic region. do. do. do. do.
<i>gigas</i> .....	*			
<i>speyeri</i> .....	*			
<i>cribellum</i> .....	*	.....	.....	
<i>alveus</i> .....	*	.....	.....	
<i>serratulæ</i> .....	*	.....	.....	
<i>malvæ</i> .....	*	.....	.....	
<i>orbifer</i> ? .....	*?	.....	.....	
<i>cynaræ</i> ? .....	*?			
<i>Syrichtus maculatus</i> ..	*	*	*	Palearctic region.
<i>Scelothrix zona</i> ? .....	.....	*?		
<i>Nisomades tages</i> .....	*	.....	.....	
<i>montanus</i> .....	*	*	*	

*PAPILIO MACHAON*, Linn. S. N. x. p. 462.

Var. *ASIATICA*, Mén. Enum. i. p. 70 (1855).

*P. asiatica*, Butl. Ann. & Mag. Nat. Hist. 1881, vii. p. 133.

Var. *HIPPOCRATES*, Feld. Verh. zool.-bot. Ges. xiv. p. 314.

*P. hippocrates*, Butl. Ann. & Mag. Nat. Hist. 1881, vii. p. 133.

Bureija (*Radde*); Ussuri (*Maack*); Askold (*Jankowsky*); Japan (*Maries*); Ningpo, Shanghai (*Pryer*); Pekin (*Bremer*); Japan (*Maries*, *Pryer*); Hakodadi (*Whitely*).

The forms of *P. machaon* found in N.E. Asia seem to be similar to the European ones, though usually larger. In Kamtschatka, according to Ménétériés, the variety which he calls *asiatica* (also found in Japan, the Himalaya, and China) occurs. It differs generally in the broader black band and markings, which, however, vary extremely, and gradually increase until in the var. *hippocrates* (which I have only seen from China and Japan) the yellow is half obliterated by the black markings. After comparing numerous specimens, I am unable to see where a line can be drawn to separate these three forms, which, taken singly, are distinct enough.

*P. XUTHUS*, Linn. S. N. xii. p. 751.

Var. *xuthulus*, Brem. Lep. Ost-Sib. p. 4, t. i. fig. 2.

Bureija (*Radde*); Ussuri (*Maack*); Askold (*Jankowsky*); Shanghai (*Pryer*); Japan (*Pryer*, *Maries*); Pekin (*Bremer*); Ningpo (*Pryer*).

Very variable in size and in the amount of black on the upper-side, some specimens from Japan having the yellow much filled up in the same way as in *P. machaon*, var. *hippocrates*. The small form *P. xuthulus* is now shown to be only a seasonal form of *P. xuthus*.

The green-tailed Papilios found in China and Japan are very puzzling, and so variable that it is not easy to say where one species

begins and another ends. Indeed, I think it very probable that they are all forms of one species from a broad point of view.

In the Himalayas this is not so; for out of hundreds of specimens which I have seen, I have found none which could not be easily distinguished; and in Sikkin no less than four species—viz. *P. paris*, *arcturus*, *ganeesa*, and *krishna*—are all found together.

In the south of China *P. paris* occurs, but, as far as I know, not within my present limits.

In Central China we find

PAPILIO BIANOR, Cr. Pap. Ex. ii. t. 103. f. C (1779).

I have seen specimens from N. China (? Shanghai, *Fortune*), Ningpo? (*Pryer*), and Mongolia? (*Mus. Godman and Salvin*). Both sexes are of a less brilliant green than the Japanese and Amur forms. The male is distinguished by a black velvety patch on the fore wing.

Further north we have:—

*P. MAACKI*, Mén. Schrenk's Reise, p. 10, t. i., which occurs in the Bureija mountains (*Radde*), on the Ussuri (*Maack*), in Askold (*Jankowsky*), and in Central Japan (*Fenton*, *Pryer*). In Amurland it has a small and very different-looking seasonal form, *P. raddei*, Brem. Lep. Ost-Sib. p. 3, t. i., which has been, I believe, proved by breeding to be the spring brood.

From Newchwang, in N. China, I find a specimen in *Pryer's* coll. which is rather larger than the average of those from the Amur, and has the blackish band on the hind wing less distinct.

In Japan it seems to vary little from the Amur type; but there are three other forms which may be varieties or species, namely:—

*P. DEHAANII*, Feld. Verh. zool.-bot. Ges. xiv. p. 323 (1864).

*P. alliacmon*, De l'Orza (ex Boisd.), Lep. Jap. p. 9 (1869).

This is common in Central Japan (*Maries*, *Pryer*), and occurs at Hakodadi (*Whitely*). What is perhaps a dwarfed form, or seasonal variety of it is

*P. BIANOR*, var. *JAPONICA*, Butler, Journ. Linn. Soc., Zool. ix. p. 50 (1866).

*P. japonica*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vii. p. 133, in which I can see no characters by which it can be certainly known.

A new species lately described, or to be described, is

*P. TUTANUS*, Fenton<sup>1</sup>.

At first sight easily distinguished by the broad yellowish band on underside of hind wing. This character, however, is variable, and in some specimens is almost absent, when the insect nearly resembles *P. maacki*. Specimens of *P. maacki* in Dr. Staudinger's collection have this band as strongly marked as in *P. tutanus*.

The next group of Papilios is that represented in the south and centre of China by the Indian species

<sup>1</sup> Vide *antea*, p. 855.

*PAPILIO PROTENOR*, Cr. Pap. Ex. i. t. 49. f. A, B (1779), which I have seen from Formosa, Hongkong, and is recorded by Felder from Ningpo. It is quoted, probably by mistake, by Motschulsky from Japan, where it is represented by

*P. DEMETRIUS*, Cr. Pap. Ex. iv. t. 385 (1782).

Common in Central Japan (*Pryer, Jonas*), N. China (*Sommer*), and occurring in the Fungwhan hills near Ningpo, whence specimens collected by Pryer are in Godman's and my own collection, which agree very well with Japanese specimens. The larva, according to De l'Orza, feeds on orange-trees.

*P. MACILENTUS*, Janson, Cist. Ent. ii. p. 158, t. v. fig. 1 (1877).

The male of this resembles generally that of the next species in colour, but is easily distinguished by the long narrow wings and long tails. The female is larger, and seems rare. It occurs at Oyama (*Jonas*), and elsewhere in Japan.

Forms of this or of the last species, probably not worthy of separation, are *P. tractipennis*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vii. p. 139, from Nikko (*Maries*), and *P. scævola*, Oberthür, Et. Ent. iv. p. 37 (1879), from China, which is identified with *P. macilentus* by Mr. Butler.

*P. ALCINOUS*, Klug, Neue Schmett. t. i. (1836).

*P. spathatus*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vii. p. 139. Japan (*Pryer, Jonas*); Yesso (*Maries*).

This species has the male black, with brown spots on the hind wings and tails beneath; whilst the female is of a pale fawn, or light brown colour. It is common in Japan; but I cannot see any good reason for distinguishing from it the species lately described by Mr. Butler, and I believe that a good series of specimens in this, as in other cases, would break down the characters on which he relies. The larva of *P. alcinous*, according to De l'Orza, feeds on *Aristolochia*.

Another form which Felder, as I think, rightly says is probably a local variety of *P. alcinous*, is

*P. MENCIVS*, Feld. Wien. ent. Mon. vi. p. 22 (1862).

? *P. plutonius*, Oberthür, Et. Ent. ii. p. 16, t. iii. fig. 2 (1876).

Described by Felder from Ningpo. I have specimens from Shanghai (*Pryer*), and have seen it from Kiukiang (*Maries*).

If *P. plutonius*, Ober., is the same, as I suspect, its range extends to North China, probably near Pekin (*David*).

It differs from *P. alcinous* principally in having the spots pink instead of fawn, and in other characters which seem variable. The sexes, however, are much less distinct in colour than in *P. alcinous*, the males being paler and the females darker.

*P. ARISTOLOCHIÆ*, Fabr. Syst. Ent. p. 443 (1775).

Specimens from the Ningpo hills (*Pryer*) are smaller than usual.

PAPILIO PAMMON, Linn. Mus. Ulr. p. 189 (1764).

*P. pammon*, var. *borealis*, Feld. Wien. ent. Mon. vi. p. 22 (1862).

Japan (*De l'Orza*), Yokohama (*Pryer*); Shanghai (*Pryer*), Ningpo (*Felder*).

I cannot follow in Shanghai specimens the characters by which Felder separates the variety *borealis*; the female, however, differs from any I have seen in the absence of the white spots on the hind wing above, which are replaced by pinkish.

P. HELENUS, Linn. Mus. Ulr. p. 185 (1764).

*P. nicconicolens*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vii. p. 139.

The Japanese insect, which seems rare, differs, according to Butler, in the form of the spots on the hind wing. I have, however, compared the type of *P. nicconicolens* (a name which should be rejected, as barbarous) with Indian and Chinese specimens, and think that it can at most be considered as a variety of *helenus*, some specimens of which from Hongkong and Darjeeling are very near it.

P. MEMNON, Linn. Mus. Ulr. p. 193 (1764).

*P. thunbergii*, Siebold, Hist. Nat. Jap. p. 16 (1824).

*P. thunbergii*, Sieb., Butler, Ann. & Mag. Nat. Hist. ser. 5, vii. p. 133.

If this species presented a constant variation in Japan, there might have been some reason for separating it; but the few specimens I have seen from Japan are not all alike, and vary as they do elsewhere. The females seem to be tailless in Japan. I have not seen it from Central or North China.

P. SARPEDON, Linn. Mus. Ulr. p. 202.

*P. teredon*, Feld. Reise Nov. Lep. i. p. 61 (1865).

Not rare in Central Japan.

The form described by Felder as *P. teredon* is from Ceylon; and I cannot see why the Japanese insect, which appears identical with Himalayan specimens, should be referred to it, as has been done by Mr. Butler in his list of the Butterflies of Nikko (Ann. & Mag. Nat. Hist. ser. 5, vii. p. 133).

P. AGAMEMNON, Linn. Mus. Ulr. p. 202.

Recorded by De l'Orza from Japan; but I have seen no specimens from there, though it occurs in Pryer's collection from Shanghai.

P. ERITHONIUS, Cram. Pap. Ex. iii. t. 232 (1782).

I have only seen specimens from Foochow (*Pryer*).

P. ALEBION, Gray, Cat. Lep. B. M. i. p. 30, t. xii. fig. 6.

North China, ? Shanghai (*Fortune*); Kiukiang (*Maries*).

The Chinese representative of *P. glycirion*.

*P. tamerlanus*, Oberthür, Et. Ent. ii. p. 13, t. ii. fig. 1 (1876), from Moupin, which I have seen in Dr. Staudinger's collection, seems the same as *P. alebion*.

*PAPILIO MARIESII*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vii. p. 23, t. iv. fig. 4.

Described from a single specimen collected by Maries at Kiu-kiang. Very near the last, but distinguished by the absence of the submarginal band on fore wings and narrower discal belt of hind wings. I notice that in a series of *P. glycerion* these bands are variable in breadth and distinctness.

#### SERICINUS TELAMON.

♂ *Pap. telamon*, Don. Ins. China, t. xxvii. fig. 1 (1798); Mén. Cat. Mus. Petr. t. vi. fig. 3.

*S. montela*, Gray, P. Z. S. 1852, p. 71; Cat. Lep. B. M. i. p. 78, t. xiii. figs. 1, 2.

♀ *S. fortunei*, Gray, P. Z. S. 1852, p. 72; Cat. Lep. B. M. i. p. 79, t. xiii. fig. 5.

♀ *S. fasciatus*, Brem. Grey, Schm. nördl. China, p. 5; Mén. Cat. Mus. Petr. t. vi. fig. 1.

♀ *S. cressoni*, Reak. Proc. Ent. Soc. Phil. iii. p. 499 (1864).

*S. TELMONA*, Gray, P. Z. S. 1852, p. 72; Cat. Lep. B. M. i. p. 78, t. xiii. fig. 3.

♀ *S. greyi*, Brem. Grey, Schm. nördl. China, p. 6, t. i. fig. 2.

There is considerable difficulty in deciding as to the species of this genus, unless one has a series from various parts of China. The specimens which I have seen vary extremely among themselves, especially as regards the presence or absence of red spots; and these can no more be considered as specific characters than in *Parnassius*. I should suppose, however, that there are two distinct forms:—one, *S. telamon*, Don. ♂, *S. fasciatus*, Brem. & Grey ♀, inhabiting the neighbourhood of Pekin; and the other, *S. telmona*, Gray, which appears to be found in the same part of China. Neither of them, as far as I know, occurs in Central China.

#### LUEHDORFIA PUZILOI, Ersch.

*L. puziloi*, Oberthür, Et. Ent. v. p. 12, t. v. fig. 2 (1880).

This is one of the most interesting and beautiful additions to our knowledge of the Palearctic fauna which have been recently made. It appears to be common in spring on the coast-region of Amurland at Nikolaiefsk, Vladivostock, and Askold, and is reported to occur also in Japan.

The female has a sort of pouch on the abdomen, analogous to that of the female *Parnassius*; but, according to M. Oberthür, this is probably not developed till after copulation has taken place. The species is also said to occur in North China.

*PARNASSIUS NOMION*, Fisch. de Waldh. Ent. ii. p. 242, t. vi.

This species seems to be the eastern representative of *P. apollo*, to which indeed it comes very close. In all the specimens I have seen from the Amur, and, according to Bremer, in the numerous varieties which he has examined, it may be distinguished from the Siberian forms of *P. apollo* by the dark borders of the wings.

PARNASSUS BREMERI, Feld. MSS., Brem. Lep. Ost-Sib. p. 6, t. i. figs. 3, 4.

Found in many parts of the Amur region flying in thick woods, as I am informed by Dr. Staudinger.

It is variable in the amount of red spots, like other members of the genus, the common form having no red spots on the fore wing like Bremer's fig. 3. His plate is wrongly numbered and does not agree with the text.

P. TENEDIUS, Eversm. Bull. Mosc. 1851, ii. p. 621; Mén. Schrenk's Reise, p. 14, t. i. fig. 3, ♀.

Of this very rare species I have seen specimens in Dr. Staudinger's collection from the Schilka. It appears to be rather an inhabitant of Central Siberia than of Amurland.

P. EVERSMANNI, Mén. Cat. Mus. Petr. i. p. 73, t. i. fig. 2.

? *P. wosnesenskii*, Mén. loc. cit. p. 74, t. i. fig. 3.

Of this extremely rare species I have only seen specimens in Mr. Godman's, Dr. Staudinger's, and the Hewitson collection. It appears to inhabit the north-eastern parts of Asia and N.W. America, but has not been found by any recent collectors.

P. GLACIALIS, Butler, Journ. Linn. Soc., Zool. ix. p. 50 (1866).

Discovered by Whitely at Hakodadi, and found also in Central Japan<sup>1</sup>. It is nearly allied to *P. stubbendorfi*, which varies considerably; but all the Japanese specimens I have seen may be readily distinguished by the different shade of white, blacker veins, and deeper-black border on inner margin of hind wings.

I think there seems little doubt that this insect was described as *P. citrinarius* by Motschulsky (Bull. Mosc. 1866, i. p. 189), as his description seems to apply very well; but as this cannot be proved without seeing the type, I refrain from changing the name, especially as the priority of date is doubtful.

P. STUBBENDORFI, Mén. Desc. Ins. Lehm. p. 57, t. vi. fig. 2.

Seems to be common in the Amur region and at Askold.

P. FELDERI, Brem. Lep. Ost-Sib. p. 6, t. i. fig. 5.

Discovered in the Bureija by Radde, and taken at Raddefskaia on the Amur by Christoph, whence numerous specimens are in Dr. Staudinger's collection. It is allied to the *P. mnemosyne* group; but is readily distinguished by the bright yellow hair on the body, not shown in Bremer's plate. The variety with red spots as figured by him is rare.

APORIA HIPPIA, Brem. Lep. Ost-Sib. p. 7, t. iii. fig. 1 (1864).

Found in the Amur region generally, sometimes flying in the

<sup>1</sup> I have since received from Mr. H. Strecker a note on Butterflies from Corea, among which was a female of *P. glacialis*.

same place and at the same time as *A. crataegi*. It may, however, be certainly distinguished from that species not only by the shape of the wings, which are longer, especially behind, but by the yellow spot at the base of the hind wing below, a character which only failed in one specimen of a long series which I examined in Dr. Staudinger's collection.

*APORIA CRATEGI*, Linn. Syst. Nat. x. p. 467.

Found in various parts of the Amur region and in Japan, but not in China as far as I know at present. Agrees perfectly with European specimens.

*PIERIS BRASSICÆ*, Linn., var. *CRUCIVORA*, Boisduval. Sp. Gén. i. p. 522 (1830).

The form of *P. brassicæ* found in Japan, which is not mentioned by Bremer, differs from the European form in the male having the spots on fore wing showing on the upper surface more or less distinctly, and in the colour of the hind wings below, which are paler and less covered with black specks; the female is of a more shining white, the fore wings clouded over the greater part of their surface with blackish, and the cell and costa of fore wings beneath greenish, which character is also observable in the male. In fact the Japanese specimens seem to me more nearly allied to *P. rapæ* than to *P. brassicæ*.

I have males from Shanghai and Amurland which agree with Japanese males. The latter is considered by Dr. Staudinger a form of *P. rapæ*, which is said by Bremer to be found in the Bureija Mountains. It is, however, rare in Amurland.

The form described by M. Oberthür as *P. rapæ*, var. *orientalis*, Oberthür. Ent. v. p. 13 (1880), from Askold, Japan, and North China, is probably the same as what I have mentioned above.

*P. MELETE*, Mén. Cat. Mus. Petr. p. 113, t. x. figs. 1-2 (1855).

The summer form of this is well figured by Ménétriés, and is easily distinguished; but the spring brood is much nearer to *P. napi*.

One male sent me by Dr. Staudinger, from Amurland, is almost devoid of the heavy markings on the upperside, and, except in tint, which is less yellow, resembles the male summer form *P. castoria* from California. I have from Askold and from Yokohama female specimens which are intermediate between *P. melete* and *P. napi* on the upper surface, and resemble *P. bryoniæ* beneath. According to Boisduval *P. melete* is found in the Himalaya; and I have specimens from the Khasia hills and Sikkim quite undistinguishable from Japanese and Askold specimens.

*Pieris ajaka*, Moore, from the N.W. Himalaya, seems very nearly allied; and *P. davidis*, Oberthür, from Moupin, must be studied in connexion with this group.



*PIERIS NAPI*, Linn. Syst. Nat. x. p. 468.

*P. aglaope*, Motsch. Et. Ent. 1860, p. 28.

*P. megamera*, Butl. Cist. Ent. i. p. 173 (1873).

*P. napi*, var. *orientis*, Oberthür, Et. Ent. v. p. 13 (1880).

The difficulty which exists in understanding the forms of *P. napi* found in America has not been overcome, though for many years many good observers were working on the spot. Mr. Edwards's admirable monograph in 'Papilio' for June 1881 has made clear one thing to my mind; and that is, that there can be no greater mistake than to decide hastily in such intricate questions as these. The East-Asiatic forms of *P. napi* are puzzling in the extreme; and as we at present know little or nothing of their distribution, seasons, and larval states, I can only say that I believe the synonyms quoted above apply to what I should consider a form of *P. napi* common in Japan and Amurland, but not hitherto seen from China. *P. aglaope* seems analogous to the European form *P. bryoniae*, considered, as I think justly, by Mr. Edwards as the parent stock of this species.

*P. GLICIRIA*, Cram. Pap. Ex. ii. t. 171.

*P. claripennis*, Butl. Ann. & Mag. Nat. Hist. ser. 4, xix. p. 96.

*P. sordida*, Butl. Ann. & Mag. Nat. Hist. ser. 4, xix. p. 96.

I have examined the types of *P. claripennis* and *P. sordida*, both of which are in Pryer's Chinese collection.

In *P. claripennis* from Shanghai the spots do not show through the upperside of fore wing, but I see no characters of note by which to separate it. *P. sordida*, from the Snowy Valley near Ningpo, seems intermediate between *P. rapæ* and *P. gliciria*, having the spots on outer margin of hind wing partly obsolete, and those on fore wing smaller than in Shanghai specimens of *P. gliciria*, which nearly correspond with Himalayan ones, though not quite so heavily marked.

I have not seen *P. gliciria* from Japan or Amurland.

*P. DAPLIDICE*, Linn. Syst. Nat. x. p. 468.

I have two specimens of this from China, locality uncertain, but probably Shanghai. I have not seen it from Japan, though De l'Orza includes it in his list. Bremer mentions it as found at Peking and on the Amur. He also includes the spring form *P. bellidice*, Ochs., under the name of

*Anthocharis belemida*, var. *orientalis*, Br. Lep. Ost-Sib. p. 8, which was found on the Onon by Radde, though not seen by Dr. Staudinger from Amurland.

*ANTHOCHARIS SCOLYMUS*, Butl. Journ. Linn. Soc., Zool. ix. p. 52 (1866).

*A. thunbergii*, De l'Orza, Lep. Jap. p. 14 (1869).

This distinct species, which seems most nearly allied to the Californian *A. lanceolata*, Bdl., is found in Northern and Central Japan and at Shanghai, the latter specimens agreeing perfectly with

those from Japan. The male has the point of the fore wing marked with orange.

ANTHOCHARIS BAMBUSARUM, Oberthür, Et. Ent. ii. p. 20, t. iii. fig. 4 (1880).

Of this rare species, described from a single specimen taken in April in the province of Tchekiang by Abbé David, I have seen one in Pryer's collection from the Ningpo hills. It seems quite distinct, though allied to *A. cardamines*.

A. CARDAMINES, Linn. Syst. Nat. x. p. 468.

According to Bremer this was found by Schrenk at Nikolaiefsk, and at Bureija by Radde. Oberthür says that David found it in East Tibet at 9000 feet elevation. I have seen no specimens from any part of Asia.

LEUCOPHASIA SINAPIS, Linn. Syst. Nat. x. p. 468.

Var. *amurensis*, Mén. Schrenk's Reise, p. 15, t. i. figs. 4, 5.

*L. sinensis*, Butl. Cist. Ent. i. p. 173 (1877).

*L. vilibia*, Jans. Cist. Ent. ii. p. 272 (1878).

According to Bremer there are intermediate forms of *Leucophasia* in Amurland which connect the type form with *L. amurensis*; and this is borne out by specimens from Amurland in Mr. Godman's collection and by others in my own from Japan. I have specimens from Amurland and Japan, which, though rather larger, agree in shape with *L. sinapis*; others from Shanghai (*L. sinensis*, Butl.) and Tokio have the longer and differently shaped fore wings which distinguish *L. amurensis*. The type of *L. vilibia*, which I have examined, is not in sufficiently good condition to be sure what it is; but I have little doubt that all the forms of *Leucophasia* found in Eastern Asia may be referred to one species.

RHODOCERA RHAMNI, Linn. Syst. Nat. x. p. 470.

Var. *aspasia*, Mén. Schrenk's Reise, p. 17, t. i. fig. 8.

Var. *nipalensis*, Doubl. Gen. D. Lep. p. 71 (1847); Gray, Lep. Nep. t. v. fig. 1 (1831).

Var. *acuminata*, Feld. Wien. ent. Mon. vi. p. 23 (1862).

Found in Amurland, Japan, and China under various forms, to which I am unable, as far as my present knowledge extends, to allow specific rank.

The European form *R. rhamni* was found in the Bureija Mountains by Radde, and, according to Bremer, at Pekin.

The form called *R. aspasia* occurs in various parts of the Amur region, and is usually known by its rather smaller size and paler colour, and, according to Ménétériés, may be certainly distinguished by the shape and venation of the wings, though I am unable to follow the distinctions he draws in the specimens before me. The Japanese form is like the one described by Felder as *R. acuminata*, which he says differs in its larger size, brighter colour, more distinct discal spots, and in having the apex of fore wing more produced. These

characters I can perceive in a Shanghai specimen before me, but do not consider them of much importance.

Chinese specimens in Dr. Staudinger's collection are more like *R. aspasia*; and Bremer states that a Chinese specimen he examined agrees with *R. rhamni*; so that the differences are evidently not constant.

The Himalayan form distinguished as *R. nipalensis* is known by its bright colour, and by the wings having the marginal spots more conspicuous than usual in *R. rhamni*, which, however, it resembles more in colour and shape than it does *R. aspasia*.

Butler includes both *R. nipalensis* and *R. aspasia* as distinct species in his list of Maries's Nikko collection (Ann. & Mag. Nat. Hist. ser. 5, vii. p. 133); so that the result of a comparison of authorities is clearly to show that not one of these forms is constant in any one locality, though no one has been able to bring together a sufficient series to prove this.

Blanchard, in Comptes Rendus de l'Académie des Sciences, vol. lxxii. p. 810, mentions, though he does not fully describe, two species of *Rhodocera* from Moupin, one of which, *R. amintha*, is a third larger than *R. rhamni*; and the other, *R. alvinda*, is said to be very near *R. aspasia* and *R. rhamni*.

*COLIAS PALCENO*, Linn. Faun. Suec. p. 272.

? *C. pallens*, Butl. Journ. Linn. Soc., Zool. ix. p. 50.

Found in various parts of the Amur countries, and in the mountains of Central Japan at 7000 feet elevation.

Both sexes agree perfectly with European specimens.

The type of *C. pallens*, Butl., from Hakodadi, which I have examined, is a miserably worn faded specimen, of no value for scientific purposes, and may be either a female of this or a small pale *C. hyale*.

*COLIAS HYALE*, Linn. Syst. Nat. x. p. 469.

? *C. poliographus*, Motsch. Et. Ent. p. 29 (1860).

*C. simoda*, De l'Orza, Lep. Jap. p. 16 (1869).

? *C. nercine*, Fisch., Motsch. Et. Ent. p. 29.

*C. erate*, Esp., Murray, Ent. M. Mag. 1876, p. 34.

*C. erate* ab *helietha*, Led., Brem. Ost-Sib., Nachtrag, p. 93.

*C. subaurata*, Butl. Ann. & Mag. Nat. Hist. ser. 5, vii. p. 138.

*C. elwesii*, Butl. loc. cit. p. 135.

The number of names under which the forms of this type found in Japan have been mentioned by various authors show the difficulty in dealing with them.

I have already given my opinion on the question in the Trans. Ent. Soc. Lond. 1880, p. 144, and further in Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 464. I will say no more, except that the form of *C. hyale* which is usually known as *C. simoda* occurs abundantly in Japan, at Askold, though apparently not generally in Amurland, and also at Pekin and Shanghai, the specimens agreeing well with the ordinary Japanese type.

I have never seen *C. erate* from N.E. Asia, though it is recorded by Bremer from Possiet Bay and by Murray from Japan. The yellow form of *C. hyale*, which is so like the female of *C. erate*, that I could not tell them apart, has probably been mistaken for it.

I would here take the opportunity of saying, in answer to Mr. Butler's repeated assertion (see Ann. & Mag. Nat. Hist. ser. 5, vii. p. 137) that *C. helicta*, Led., cannot be a hybrid, that I am assured by Dr. Staudinger that the two species *C. edusa* and *C. erate* which produce it do fly together in abundance at Sarepta on the Volga, and that Kinderman, Becker, and Christoph have not once, but repeatedly, taken them in *copulâ*. Mr. Strecker also tells me that hybrids between *Colias philodice* and *C. eurytheme* are not uncommon in both sexes in the United States, and that they look much like the Russian hybrid *C. helicta*.

P.S. Mr. Strecker writes me that he has true *erate* from Japan smaller than the Russian ones, the female darker on upperside of hind wings, but the male has the unspotted border just like the Russian examples. In a second letter he writes that "the Japanese male *C. erate* is undoubted; what I take to be the female, and which I got along with it, is like the female Russian *C. erate* suffused with dark scales on the upperside of hind wing, whilst in *C. simoda* (*C. hyale*, var.) the clear lemon-yellow prevails."

*COLIAS MELINOS*, Evers. Bull. Mosc. 1847, iii. p. 72.

Found on the Schilka and the Amur by Radde, but appears very rare in collections. It is nearly allied to *C. phicomone*.

*C. AURORA*, Esp. t. 83. f. 3.

Found at Raddefskaia, Blagovestchensk on the Ussuri, and other places in Amurland; but the females seem rare. There are two forms of this sex, as in other species of this section of the genus—*C. chloë*, Evers. Bull. Mosc. 1847, t. iv. figs. 3, 4, being the pale-coloured one; the other is extremely bright reddish orange. This species represents *C. edusa* in North-eastern Asia; no species of that section is known to me in Japan or China at present.

*TERIAS LETA*, Boisd. Sp. Gén. i. p. 674; var. *JÆGERI*, Mén. Cat. Mus. Petr. p. 84, t. ii. fig. 1 (1855).

The variety found in China and Japan differs from the majority of Indian specimens in having a narrower black border to the fore wings, which is sharply interrupted near the hind margin in the way shown in Ménétrés's figure.

Some Himalayan and Khasia specimens have the band interrupted in the same way; but the Japanese examples can, as far as I have seen, be distinguished. Ménétrés, by mistake, says that *T. jaegeri* came from Hayti, where, of course, no such insect exists. It seems common in Japan, and is found at Shanghai.

*TERIAS BETHESBA*, Janson, Cist. Ent. ii. p. 272 (1878).

As far as I can judge, this is a good species, intermediate between *T. læta* and *T. hecabe*. The females are easily known, being of a pale dull lemon-colour, more or less clouded with dusky scales. It seems very like the figure and description of *T. venata*, Moore.

*T. HECABE*, Linn. Mus. Ulr. p. 249 (1764).

*T. hecabeoides*, Mén. Cat. Mus. Petr. p. 85, t. ii. fig. 2.

? *T. sinensis*, Luc. Rev. Zool. 1852, p. 429.

*T. mariesi*, Butl. Trans. Ent. Soc. 1880, p. 198, t. vi. figs. 1-7.

This wide-ranging and variable species is common in China and Japan. Mr. Butler's paper on the Japanese species of *Terias* gives full details of the variations and supposed hybrids between this species and the next.

I can see no reason for separating *T. mariesi*, the difference in the shade of yellow which Mr. Butler relies on being variable in my specimens from Yokohama.

*T. ANEMONE*, Feld. Wien. ent. Mon. vi. p. 23 (1862); Butl. Trans. Ent. Soc. 1880, p. 199, t. vi. figs. 8-11.

Found in Japan, where, according to Mr. Butler, it connects *T. hecabe* with *T. mandarina* by almost insensible gradations.

With regard to this species Mr. Butler says (Trans. Ent. Soc. 1880, p. 200):—"So far as I have been able to judge, the *T. hecabe* and *T. mandarina* of China are constant; the intermediate *T. anemone* does not come from that country, in which case hybridization cannot modify the typical forms."

Mr. Butler appears to have entirely overlooked the fact that the type of *T. anemone* is expressly stated to have come from Ningpo. It is also quoted in Pryer's list of Rhopalocera of Chekiang and Kiangsoo provinces, in Ent. Mo. Mag. 1877, p. 52; and there are specimens in Pryer's collection marked "Snowy Valley, Ningpo."

*T. MANDARINA*, De l'Orza, Léop. Jap. p. 18 (1869); Butl. Trans. Ent. Soc. 1880, p. 199, t. vi. figs. 13-18.

Common in Japan, and occurs also in Formosa, whence two specimens are in Pryer's collection. I have, however, seen none from China, though Mr. Butler says it occurs there.

With regard to the supposed hybrids named and figured by Butler in the Trans. Ent. Soc. 1880, p. 197 *et seq.*, I would call attention to the utter want of evidence of the hybrid origin of the specimens which he names *T. hybrida* (No. 7) and *T. comexiva* (No. 12). Judging from the plates, the differences between Nos. 6, 7, 8, and 10 are extremely trifling, and equally so are the differences between Nos. 12, 13, 14, and 15. We are informed that the absence of 6 specimens out of 150, which are presumably represented by figs. 7 and 12, will leave the three species as sharply defined as any in the genus, and we are asked to believe without further evidence that on this account the six specimens are hybrids.

MILETUS HAMADA, Druce, Cist. Ent. i. p. 361 (1875).

A distinct species, unlike any thing I have seen from China or Japan, but nearly allied to a specimen in my collection from Darjiling, which differs in having an indistinct whitish patch on the fore wing, which may be sexual. I have seen a specimen from Shanghai collected by Christoph, which comes very close to, if it is not identical with, those from Sikkim in Dr. Staudinger's collection. There is a single specimen in Pryer's collection, without indication of locality, which differs considerably from *M. hamada* beneath, but agrees with it above.

LAMPIDES? sp.

An apparently new species, which will no doubt be described by Mr. Butler, is in the British-Museum collection from Kiukiang (*Maries*).

LYCÆNA? sp. nov.

A very distinct species, from Mr. Fenton's collection, of which I have only seen one specimen at Mr. Janson's. It is of a deep shining blue, with black border above and pale green beneath.

CURETIS ACUTA, Moore, Ann. & Mag. Nat. Hist. ser. 4, xx. p. 50.

Nearest to *Curetis* (*Anops*) *bulis*, Hew., but differs in both sexes in the prolongation of the apical angle of fore wing. The specimens from Shanghai (*Pryer*) and Japan (*Pryer*, *Jonas*), which I have seen, agree fairly.

The female, which is of a blue-grey colour, seems much rarer than the male.

C. TRUNCATA, Moore, Ann. & Mag. Nat. Hist. ser. 4, xx. p. 50.

From Shanghai (*Holdsworth*). I have not seen this species, and can say nothing as to its specific difference.

AMBLYPODIA JAPONICA, Murray, Ent. Mo. Mag. 1875, p. 170.

Allied to *A. rama*, Köll., from the Himalaya; the fore wings more produced at the apex, and the hind wings without a tail.

Found at Yokohama, but seemingly not common in Japan. This species has been referred by Mr. Butler to *A. asinarus*, Feld. Reise Nov. ii. p. 235, 1865; but as this species comes from Cochin and is not figured, I am doubtful as to the identification.

A. TURBATA, Butl. Ann. & Mag. Nat. Hist. ser. 5, vii. p. 133.

This species is named but not described by Mr. Butler, though the specimens in the British Museum appear to be fully distinct from *A. japonica*, being larger, differently shaped, and with conspicuous tails to the hind wings, which *A. japonica* never has. *A. turbata* is from Nikko. There is a specimen resembling this in Pryer's collection, without indication of locality, but probably from China.

## NIPHANDA FUSCA.

*Thecla fusca*, Brem. & Grey, Schm. nördl. China, p. 9 (1853).

*Thecla fusca*, Mén. Cat. Mus. Petr. i. t. iv. (1855).

♀ *Amblypodia dispar*, Brem. Lep. Ost-Sib. p. 24, t. iii. (1864).

*Polygonmatus fuscus*, Oberthür, Et. Ent. ii. p. 20, t. iv.

This species is recorded from the Amur and Pekin (*Bremer*). I have specimens from Ningpo (*Pryer*) and Japan (*Pryer*) which agree very well with Bremer's and Oberthür's figures. The female differs considerably from the male. There are specimens in Dr. Staudinger's collection from Raddefskaia and Baranfsky. This species is referred by Butler to Moore's genus *Niphanda*, of which the type is *N. tessellata*, Moore, P. Z. S. 1874, p. 572, t. lxvi. fig. 6. It does not, however, seem to resemble the figure of this insect in form or colour.

DIPSAS SÆPESTRIATA, Hew. Ill. Diurn. Lep. p. 67, t. xxvi. (1865).

This species seems common in Japan, and occurs also at Vladivostok, where it was taken by Dörries.

D. LUTEA, Hew. Ill. Diurn. Lep. p. 67, t. xxvi. (1865).

This species also occurs in the same localities as the last, but does not seem so common.

D. JONASI, Jans. Cist. Ent. ii. p. 157.

Taken at the Yokawa river in Japan by Jonas. A single specimen from Askold, collected by Dörries, is in Dr. Staudinger's collection.

D. RAPHAELIS, Oberthür, Et. Ent. v. p. 20, t. v. fig. 1 (1880).

This species, which is allied to the last, is from Askold, where it appears to be not common.

D. MICHAELIS, Oberthür, Et. Ent. v. p. 19, t. v. fig. 2 (1880).

This species, which is also from Askold, appears to belong to the same group as the four preceding, though the yellow of the upper surface is much overlaid with brown.

THECLA SMARAGDINA, Brem. Lep. Ost-Sib. p. 25, t. iii. fig. 5.

*T. taxila*, Brem. loc. cit. p. 26, t. iii. fig. 7.

The group of *Theclæ* with green males and brown or purplish females is very well represented in Amurland and Japan, as also in the Himalayas. There is, however, much difficulty in making out some of the forms, and it was only after I had consulted Dr. Staudinger that I came to any conclusion on the subject. Bremer figures *T. taxila* twice over, what he considers as the female being I believe the female of *T. smaragdina*, and what he calls the male being probably the female of a form of *T. japonica* occurring in Amurland. No male insect of that colour is yet known among the various species of this group of *Theclæ*; and if *T. taxila* is a distinct species, we

have no male for it or female for *T. smaragdina*, M. Oberthür having made a mistake when he said that he had males of *T. taxila*.

The species is common in the littoral region of Amurland, and as far up the river as Raddefskaia. I think it also occurs in Yesso; but the specimens from thence are smaller, and do not perfectly agree with those from the mainland.

*T. smaragdina* is easily distinguished in the male sex by the short bar across the underside of fore wing; but this bar does not seem to be constantly present in the female, which, however, may be known by the colour of the underside.

*THECLA JAPONICA*, Murray, Ent. Mo. Mag. xi. p. 169 (1874).

? *Dipsas taxila*, Hew. Ill. Diurn. Lep., Supp. p. 16, t. vi. figs. 16, 17.

Var. a. ♀. *T. fasciata*, Jans. Cist. Ent. ii. p. 272, t. v. fig. 4 (1878).

*T. smaragdoides*, Staudinger in litt.

*T. taxila*, Oberthür, Et. Ent. v. p. 18; ? Bremer, t. viii. fig. 2.

Ab b. *aurorina*, Oberthür, loc. cit. (*flavo-maculata*).

This species is easily distinguished from *T. smaragdina* by the darker colour of the underside. The variation of the female has given rise to much confusion in the nomenclature of this insect; but I believe the synonymy above is correct. The females appear to be dimorphic, as, until it can be shown that there is a male different from *T. japonica* which can be assigned with certainty to *T. fasciata*, I fail to see the propriety of separating that form, which corresponds very fairly with similar female aberrations in Amurland.

M. Oberthür has females from Askold which, he says, are a perfect transition between the types of *T. aurorina* and *T. fasciata*.

There is also a form, of which Dr. Staudinger has three males and one female from Vladivostock and Askold, which comes very near *T. japonica* from Amurland, but which is perhaps only a variety or hybrid between it and *T. orientalis*, both of which occur in the same localities.

Lastly, we have a form separated by Dr. Staudinger as

*T. SAPHIRINA*, Stdgr. MSS.,

which differs from any of the others in the colour and markings of the underside, in which it is nearest to *T. attilia*. Of this only one male and two females are known, from the coast-region of Amurland.

*T. ORIENTALIS*, Murray, Ent. Mo. Mag. ser. 4, x. p. 169 (1875).

? *T. diamantina*, Oberthür, Et. Ent. v. p. 18, t. i. fig. 1 (1880).

This species, which is easily distinguished by its larger size and paler colour, occurs not uncommonly in both Japan and the coast-region of Amurland. Specimens from Askold agree perfectly with Japanese examples.

*T. diamantina* is considered by Dr. Staudinger a synonym of this species; but the figure of it agrees, I think, more closely with the true *T. smaragdina*, which I have from Amurland.



*THECLA ARATA*, Brem. Lep. Ost-Sib. p. 25, t. iii. fig. 6 (1864).

? *T. tyrianthina*, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 34, t. iv. fig. 5.

I have seen specimens of this from the Amur, Japan, Yesso (*Mus. Hew.*), Kiukiang, China (*Maries*). It is also found at Pekin (*Bremer*). The Yesso specimen is smaller than the others; but the one described as *T. tyrianthina* from Kiukiang appears to be nearly the same as *T. arata*, though the specimens are too much worn to be relied on.

*T. MICANS*, Br. & Grey, p. 9; Mén. Cat. Lep. Mus. Petr. t. iv. fig. 4

? *T. betuloides*, Blanch., Butl. Ann. & Mag. Nat. Hist. ser. 5, vi. p. 34, t. iv. fig. 2.

Of this species the male only is described by Bremer, from Pekin; but a female specimen is in Pryer's collection from Shanghai which, I think, must belong to it. What I think is probably the same insect is also mentioned by Butler as *T. betuloides*, from Kiukiang (*Maries*). It is allied to *T. setira*, Moore, from the north-west Himalaya.

Three specimens, two males and one female, from Chefoo, in Dr. Staudinger's collection differ slightly in being of a yellower ground-colour below than in my specimen; and the male has the red on disk of fore wing more distinct than in Bremer's figure.

*T. AVIDIENA*, Hew. Ent. Mo. Mag. 1877, p. 108.

A very distinct species, which I have seen from Shanghai (*Pryer*) and Kiukiang (*Maries*). The disks of both wings above are bluish; beneath it is of a reddish brown, with a broad silvery Y-shaped bar on the hind wings.

*T. CÆRULESCENS*, Motsch. Bull. Mosc. 1866, i. p. 191.

I am unable to identify this species, which is described as like the next but without yellow spots.

*T. CÆRULEA*, Brem. & Grey, p. 8 (1853); Mén. Cat. Lep. Mus. Petr. t. iv. fig. 4.

I have never seen this species, which has hitherto only been found at Pekin. It is unknown in any of the collections I have seen.

*T. ATILIA*, Brem. Lep. Ost-Sib. p. 24, t. ii. fig. 3.

Found in the Bureija Mountains by Radde; also in Japan.

It seems allied to *T. odata*, Moore, from the N.W. Himalaya. It does not seem to occur generally in the Amur region, as Dr. Staudinger has never seen it in collections from there.

*T. GRANDIS*, Feld. Wien. ent. Mon. vi. p. 24 (1862).

*T. eretria*, Hew. Ill. Diurn. Lep. p. 114, t. 42 (1869).

Felder's description, which was taken from a single bad specimen from Foochow, agrees very well with Hewitson's figure, and with a specimen in Pryer's collection from Ningpo. It is a large insect, resembling *T. w-album* in markings, but with the costa of fore wings more curved.

? *THECLA W-ALBUM*, Knoch, Beiträge, ii. p. 85 (1781).

Found at Pekin (*Bremer*); a specimen from there is in the British Museum. Also at Shanghai (*Pryer*).

Differs from the European insect in having usually a larger blue spot at the anal apex, and a double line of pale lunular markings on the fore part of the hind wing below. No specimen in Dr. Staudinger's collection quite agrees with this, which may be a distinct species.

*T. MERA*, Jans. Cist. Ent. ii. p. 157 (1877).

This species, found at Matzabaro, Japan, by Mr. Jonas, is allied to *T. pruni* of Europe; but the few specimens I have seen differ sufficiently from that species.

*T. stygiana*, Butl. Ann. & Mag. Nat. Hist. 1881, vii. p. 35, t. iv., fig. 6, from Nikko, seems very near it; but the type specimen is not fresh enough to be described with accuracy.

*T. PRUNOIDES*, Stdgr. MSS.

This was taken at Vladivostock by Christoph; but though very near *T. w-album*, the markings of the hind wing beneath are, as Dr. Staudinger thinks, sufficiently different to separate it from that species. He has also a specimen from the Altai.

*T. PRUNI*, Linn. Syst. Nat. x. p. 482.

Occurs at Vladivostock and on the Lower Ussuri.

*T. PHYLLODENDRI*, Stdgr. MSS.

A distinct species allied to *T. pruni*, but distinguished by a double line of black spots on the underside of both wings. It was taken at Vladivostock by Christoph, and at Baranofsky by Dörries.

? *T. SPINI*, Schiff. S. V. p. 186.

Recorded by Bremer from Pekin, and by De l'Orza from Japan; but I have seen no specimens from Asia, and Dr. Staudinger has none from any locality east of the Caspian.

*T. RUBI*, Linn. Syst. Nat. x. p. 483.

Recorded by Bremer from Onon (*Raddé*), and by De l'Orza from Japan; but I have seen no specimens from Eastern Asia.

*T. ENTHEA*, Jans. Cist. Ent. ii. p. 157 (1877).

A very distinct species, easily known by the coloration and spots of the under surface.

It was described from the Yokawa river, Japan, collected by Jonas, but is rare in collections. I have seen a specimen in Dr. Staudinger's collection from Vladivostock (*Christoph*) which agrees perfectly with it.

*THECLA FRIVALDSZKYI*, Led. Verh. zool.-bot. Ges. Wien, 1855, p. 100, t. i. fig. 1.

? *Lycæna ferrea*, Butl. Journ. Linn. Soc., Zool. ix. p. 57 (1866).

*Satsuma ferrea*, Murray, Ent. Mo. Mag. xi. p. 168 (1874).

I was disposed to consider the Japanese and Amur form of this species distinct till I saw the series of *T. frivaldszkyi* in Dr. Staudinger's collection. He, however, judging from a typical Japanese specimen I showed him, thinks them identical. As a rule the Japanese insect is deeper in colour on the underside; but a specimen in Hewitson's collection from Yesso, where I believe the type of *T. ferrea* was taken, is nearer to the Amur form.

Mr. Murray considers this species to form a distinct genus; and it is certainly very unlike any other European or Asiatic *Thecla*, though apparently very nearly allied to *Thecla irus*, God., and other North-American species.

*POLYOMMATUS VIRGAUREÆ*, Linn. Syst. Nat. x. p. 484.

Found at Pekin (*Bremer*) and in the Apfelgebirge by Radde, also on the Upper Amur by Hedemann.

*P. AMPHIDAMAS*, Esp. t. 58. fig. 4 (1779).

Found at Schilka by Hedemann, and Onon by Radde.

*P. HIPOTHOE*, Linn. Faun. Suec. ii. p. 274 (1761).

Found at Pekin and on the Amur at Raddefskaia and the Ussuri by Christoph.

*P. PHLEAS*, Linn. Faun. Suec. p. 285.

Var. *eleus*, Fab. Suppl. Syst. Ent. 430.

*P. phleas*, var. *chinensis*, Feld. Verh. zool.-bot. Ges. Wien, xii. p. 488 (1862).

Found in Amurland, Japan, and China.

Dr. Staudinger says the Amur variety resembles the American one, having the red line on underside of hind wings more conspicuous than in European specimens.

I see nothing remarkable in the Chinese insect, of which I have three from Ningpo; one of these is much larger than European specimens. All the Japanese and one of the Chinese specimens are of the dark summer brood (*eleus*, Fab.).

*LYCÆNA BÆTICA*, Linn. Syst. Nat. xii. p. 789.

Found in Japan and at Shanghai, but not known in Amurland.

*L. ARGIADES*, Pall. Reise, xii. p. 472.

*L. hellotia*, Mén. Cat. Mus. Petr. 124, t. x. (1857).

? *L. praxiteles*, Feld. Reise Nov. p. 281, t. xxxv.

This species seems to be widely distributed through Northern and Eastern Asia, China, and Japan. I have compared many specimens from Amurland, Shanghai, and Japan, and find them so very variable, both in size, colour, and the spots of the hind wing, that I am unable

to see how the larger and brighter specimens described as *L. hellotia* and *L. praxiteles* can be separated from *L. argiades*. As a rule the Oriental and Japanese specimens are larger and more richly spotted, especially at Tokio, Japan; but some of those from Askold (*Jankowsky*) and Shanghai (*Pryer*) are quite as small as German specimens of *L. polysperchon*, Berg. This variety also occurs on the Ussuri at Raddefskaia and Askold.

*LYCÆNA FISCHERI*, Evers. Bull. Mosc. 1843, p. 537, t. ii.

Found at Vladivostock and Askold, also at Shanghai, but not, so far as I know, in Japan. Chinese specimens do not agree perfectly with Siberian ones. They are smaller, and the blue eyes do not show through the hind wing of female; but I do not think they can be separated. There is in Pryer's collection a species marked "*flicaudis*, Pryer, type," of which I can find no published description, and which I think belongs to this species.

*L. ARGIA*, Mén. Cat. Mus. Petr. 125, t. x. (1857).

? *L. japonica*, Murray, Ent. Mo. Mag. xi. p. 167 (1874).

This species is a very puzzling one, and, without seeing the type specimens, impossible to decide upon.

I have specimens which agree perfectly with Ménétriés's description, and others from the same localities agreeing with Murray's description of *L. japonica*, of which he only knew the female. Ménétriés's plate, however, represents an insect which might well be a faded male of *L. ægon*; and in his description he compares the species with *L. optilete*.

From Shanghai are other specimens, referred by Moore to *L. otus*, Fab.; and in various collections I find specimens of the same or a nearly allied species referred to *L. maha*, Koll., from Kashmir, *L. chandala*, Moore, from Shanghai, Hongkong, *L. diluta*, Feld., from Swatow. There are also specimens in my own and Hewitson's collection from Sikkim, Calcutta, and N.W. Himalaya coming very close. I am quite unable to say what are the limits and distinctive characters of these various species, if they are distinct.

*L. LYSIMON*, Hübn. Eur. Schmett. t. 535. f. 5.

Of this wide-ranging species I have specimens from Shanghai, and one doubtfully from Japan which comes very close to it. There are specimens referred to this species in Dr. Staudinger's collection from Amoy, Foochow, and Macao.

*L. CLEOBIS*, Brem. Bull. Acad. Petr. iii. p. 472 (1861).

*L. ægonides*, Brem. Lep. Ost-Sib. p. 28, t. iii. fig. 8 (1864).

From Raddefskaia, Baranofsky, and other parts of the Amur region. Some specimens of the Japanese *L. argus* ♀ come very near this; but *L. cleobis* may be distinguished by its broad white fringe and darker tint, especially in the male sex.

LYCÆNA ARGUS, Linn. Syst. Nat. x. p. 483.

This species occurs at Askold, Vladivostock, and in Japan, where the specimens are very large and dark, and the females have conspicuous ocelli showing through the upperside of the hind wing. I have also specimens from Pryer's collection from Shanghai, which I should be disposed to refer to this species, though they are probably what Murray has described, in Trans. Ent. Soc. 1874, p. 523, t. x., as *L. chinensis* from North China. His figure, however, shows a more distinct brown band, as in *L. pylaon*, and no blue ocelli, as in *L. argus*, which my specimens certainly have. It is probable that *L. chinensis*, whatever it is, refers to the species which Bremer calls *L. pylaon* in his Pekin list. Dr. Staudinger, however, has never seen *L. pylaon* from any part of Eastern Siberia.

*L. ÆGON*, Schiff. S. V. p. 185 (1776).

*L. micrargus*, Butl. Cist. Ent. 1878, p. 283.

Found in various parts of the Amur region, and less commonly in Japan. I have a pair, collected by Fenton near Tokio, which I believe to be the same as Mr. Butler's *L. micrargus*, of which I have seen the type in the British Museum.

*L. ORION*, Pallas, Reise, t. i. p. 471 (1771).

Found in various parts of the Amur region and at Pekin, but not as yet in Japan.

*L. BATON*, Berg. Nom. t. 60. 6-8 (1779).

Only seen from Askold and Vladivostock.

*L. ASTRARCHE*, Berg. Nom. iii. p. 4, t. 49.

I have seen one specimen from Askold in Dr. Staudinger's collection, and others of the variety *allous*, Hübn., from various parts of Amurland.

*L. ICARUS*, Rott. Naturf. vi. p. 21 (1775).

A single, very large and well-marked specimen is recorded by Bremer from the Lower Ussuri; but I have seen none from Eastern Asia.

*L. EROS*, Ochs. i. 2, p. 42 (1808).

Recorded by Bremer from the Bureija Mountains, but I have seen no Amur specimens.

*L. AMANDA*, Schn. N. Mag. iv. p. 428 (1792).

A variety of this species from the Amur has the red spots on margin of hind wing beneath larger and brighter than in European examples. It is recorded by Bremer from the Bureija and Lower Ussuri.

*LYCÆNA EUMEDON*, Esp. 52, 2 (1780).

Of this species I have only seen a single Amur specimen in Dr. Staudinger's collection.

*L. BITON*, Brem. Lep. Ost-Sib. p. 30, t. iii. fig. 9.

Of this species, found by Maack between the mouth of the Ussuri and the Amur, I know nothing beyond Bremer's figure. It seems allied to *L. donzelii*, Boisd.

*L. ARGIOLUS*, Linn. Syst. Nat. x. p. 483.

*L. ladonides*, De l'Orza, Lép. Jap. p. 20.

Common in the Amur region, Japan, and found by Pryer at Shanghai.

*L. MINIMA*, Fuessl. Verz. p. 31 (1775) (*alsus*, Schiff.).

Only found in the Bureija by Radde.

*L. SEMIARGUS*, Rott. Naturf. vi. p. 20 (1775) (*acis*, Schiff.).

I have one specimen from the Amur; it is recorded from the Bureija and Lower Ussuri by Bremer.

*L. CYLLARUS*, Rott. Naturf. vi. p. 20 (1775).

Found in the Bureija and on the Ussuri; whence I have seen one specimen in Dr. Staudinger's collection.

*L. ARIONIDES*, Stdgr. MSS.

Of this species, which Dr. Staudinger considers distinct, I have one specimen from Japan, collected by Fenton, agreeing with those from the Amur in his collection.

It may be only a form of *L. arion*, and resembles the var. *cyanecula*, Evers., on the upper surface, but has not so much green below. It is best distinguished by the large confluent black spots on underside of fore wings.

*L. LYCORMAS*, Butler, Journ. Linn. Soc., Zool. ix. p. 57 (1866).

*L. scylla*, Stdgr. MSS.

I have examined the type of *L. lycormas* from North Japan in the British Museum, and believe that *L. scylla*, of which I have specimens from Askold (*Jankowsky*) and the Amur, are identical with it.

It is allied to *L. cyllarus*, but differs in the conspicuous black spots on the underside of hind wing, and has much less blue on the underside, and the white fringe more conspicuous.

*L. PRYERI*, Murray, Ent. Month. Mag. x. p. 126 (1873).

A large and distinct species, which seems abundant in Japan, and of which I have seen specimens from Vladivostock, Raddefskaia, and the Ussuri in Dr. Staudinger's collection.

LYCÆNA ARION, Linn. Syst. Nat. x. p. 483.

Of this I have only seen one specimen, from Raddefskaia; and Radde took a single very large one in the Bureija Mountains.

*L. EUPHEMUS*, Hb. 254-256.

? *L. kazamoto*, Druce, Cist. Ent. 1875, p. 361.

The type of *L. kazamoto*, which I have examined in Godman and Salvin's collection, is very dark, the spots hardly showing; but I think it is only a variety of *L. euphemus*, which seems extremely variable in Japan. It is marked as taken at 6000 feet elevation. Japanese specimens vary much in the expanse of the wings; and most of them have a black spot at the base of the fore wing below, which does not appear in European specimens.

This species seems common in certain parts of Central Japan, and occurs also at Yesso (*Whitely*) and at Raddefskaia in Amurland.

LIBYTHEA, sp.

*L. lepita*, Moore, Cat. Lep. E.I. C. Mus. p. 240.

The Japanese species of *Libythea* has been referred by authors to *L. lepita*, Moore, from the Himalayas, which is described as differing from *L. myrrha*, Godt., in the ferruginous streak from base of fore wing being divided into two portions—the first within the discoidal cell, the second a round terminal spot beyond its extremity.

Six specimens from Sikkim and Nepal in my collection all belong to *L. myrrha*; and a specimen from Japan is intermediate between that and the European *L. celtis*, to some specimens of which it comes near in the arrangement of the markings. The band on the hind wing is narrower than in either *L. myrrha* or *L. celtis*; and the colour of the underside different.

ZEMEROS FLEGYAS, Cr. Pap. Ex. iii. t. 280.

A single specimen was in Pryer's Shanghai collection; and it is included in his list of Chinese Butterflies in Ent. Month. Mag. 1877, p. 52.

CHARAXES NARCEUS, Hew. Ex. Butt. i. *Nymph.* t. 1.

Var. *mandarinus*, Feld. Reise Nov. p. 437.

Found at Shanghai by Pryer.

DICHORRAGIA NESIMACHUS, Boisd., Cuv. Règne An. Ins. ii. t. 139 bis (1836).

Not uncommon in Japan, and probably found in China, though I have seen no specimens from there. It agrees with Sikkim specimens, though the white markings at the apex of the fore wing are shorter.

APATURA IRIS, Linn. Syst. Nat. x. p. 476.

Found in the Bureija Mountains by Radde, and at Raddefskaia and Askold. It is reported to exist in Japan; but I have never seen specimens from there.

The Amur specimens are somewhat larger than European examples.

*APATURA ILIA*, Schiff. S. V. p. 172.

Var. *clytie*, Schiff. S. V. p. 321.

*A. here*, Feld. Wien. ent. Mon. vi. p. 27 (1862).

*A. substituta*, Butl. Cist. Ent. i. p. 159 (1873).

Found in Amurland, at Pekin, Shanghai, and in South and Central Japan. The form described as *A. here*, from Ningpo, is said by Felder to differ constantly in the termination of the interior band of the hind wing, less easily seen in the male than the female; but Dr. Staudinger agrees with me in uniting it with *A. clytie*. Oberthür says Askold specimens do not differ from the French type; and the Japanese form, though varying somewhat, is probably the same as the Chinese insect. Some specimens come very close in colour to the var. *metis* from Sarepta, but have the anal ocellus as large as in *A. ilia*.

*HESTINA ASSIMILIS*, Linn. Mus. Ulr. p. 300 (1764).

Found in Central China and in Japan, though I have no specimens from the latter country.

*EURIPUS CHARONDA*, Hew. Ex. Butt. iii. t. 1. fig. 1 (1863).

Not rare in Japan, but extremely difficult to take in good condition, on account of its strong and high flight.

Perfect specimens of this splendid insect are very rare in collections.

*E. JAPONICA*, Feld. Wien. ent. Mon. vi. p. 27 (1862).

Common in Central Japan.

*ADOLIAS SCHRENKI*, Mén. Bull. Acad. Péters. xvii. p. 215 (1859); Schrenk's Reise, ii. p. 31, t. iii. fig. 2.

Taken at Raddefskaia, on the Ussuri, and elsewhere in Amurland.

*PARAPLESIA ADELMA*, Feld. Wien. ent. Mon. vi. p. 20 (1862).

*Isodema adelma*, Feld. Wien. ent. Mon. vii. p. 109; Reise Nov., Lep. iii. t. 54. figs. 1, 2.

Of this fine species I have seen two specimens from the Ningpo hills in Pryer's collection.

In this genus the discal cell is completely closed by a vein, which, though not very apparent on the upper surface, is strongly developed below.

*ATHYMA SULPITIA*, Cr. Pap. Ex. iii. t. 214 (1782).

*A. sulphitia*, var. *ningpoana*, Feld. Wien. ent. Mon. vi. p. 26.

The variety described by Felder from the Ningpo hills is said to differ from the form found in South China in having the spots of the cell confluent, forming a stripe, and in other characters. There is a specimen from the Snowy Valley which is probably this, as it does not agree well with Cramer's plate.



*ATHYMA PRYERI*, Moore, Ann. & Mag. Nat. Hist. ser. 4, xx. p. 47.

From the Snowy Valley, near Ningpo (*Pryer*).

This species seems very near the last, but has the second white band on the hind wings reduced to a line of spots margined with white.

*LIMENITIS HELMANNI*, Lederer, Verh. zool.-bot. Gesellsch. Wien, 1853, p. 356, t. i. fig. 4.

Found at Askold, Blagovetschensk, Onon, the Ussuri, and also, according to De l'Orza, in Japan, though I have seen no specimens from there. Specimens from the Altai have the bands and spots narrower than Amur specimens.

? *L. HOMEYERI*, Taneré, Ent. Nach. 1881, p. 120.

Seems to me but a variety of *L. helmanni*, though some specimens have a distinct marginal white line on upper surface of hind wings, which is faint or absent in *L. helmanni*.

Found at Raddefskaia, Blagovetschensk, and the Ussuri.

*L. AMPHYSSA*, Mén. Schrenk's Reise, p. 21, t. iii. fig. 1.

Found in many parts of the Amur region, and, according to De l'Orza, in Japan; but I have never seen specimens from the latter.

*L. SYDYI*, Led. Verh. zool.-bot. Gesell. Wien, 1853, p. 357, t. i. fig. 3.

Var. *latifasciata*, Mén. Schrenk's Reise, p. 30, t. iii. fig. 1.

De l'Orza says that Japanese specimens (which, however, I have never seen) hardly differ from Altai specimens. This is probably an error, as *L. sydyi* has not been found on the Amur, and the variety *L. latifasciata* is very distinct in all the specimens I have seen, having the white bands on both wings nearly twice as broad as in typical *L. sydyi*. Indeed, if no intermediate forms occur, I think it might fairly be separated.

*L. POPULI*, Linn. Syst. Nat. x. p. 476.

Found at Raddefskaia, on the Ussuri, and in the Bureija Mountains.

The males from Amurland have the white bands as broad as in females from Europe, and differ remarkably from European males, which are, in some localities at least, usually of the form known as *L. tremulæ*, Esp. 114.

*L. NYCTEIS*, Mén. Schrenk's Reise, p. 28, t. ii. fig. 11.

*Athyia cassiope*, Mén. loc. cit. p. 27, t. ii. fig. 10.

Found at Raddefskaia and on the Ussuri. A distinct species.

The insect described as *L. cassiope*, from a single female taken by Maack, does not seem to have been discovered by later collectors, and is thought by Dr. Staudinger to be an aberration of *L. nycteis*.

*L. SIBYLLA*, Linn. Syst. Nat. x. p. 781.

Common in Japan, where it agrees very well with European specimens; but in Amurland Dr. Staudinger finds that the white bands are always narrower.

*LIMENITIS SINENSII*, Oberthür, Et. Ent. ii. p. 25, t. iv. fig. 8.

A very distinct species, only found by Abbé David in the Chinese province of Kiangsi.

*NEPTIS* ? *RADDEI*, Brem. Lep. Ost-Sib. p. 18, t. i. fig. 9.

This is so unlike any other species of *Neptis* that I doubt the propriety of including it in the genus; the female is very rare, and agrees with the male in colour.

It is found at Blagovetschensk, Raddefskaia, and at Askold.

*N. THISBE*, Mén. Schrenk's Reise, p. 26, t. ii. fig. 9.

A distinct species, resembling some of the Himalayan species in coloration. The female, which is very rare, is rather paler in colour. Bremer says that in a variety from the Ussuri the bands and spots are almost white.

*N. PHILYRA*, Mén. Schrenk's Reise, p. 25, t. ii. f. 8.

Found at Raddefskaia, on the Ussuri, and elsewhere. It is probable that some of the specimens in collections under this name belong to the following.

*N. PHILYROIDES*, Stdgr. MSS.

From Raddefskaia and the Ussuri. Seems commoner than the last, from which it is distinguished by two white spots on the costa, and by the paler colour of the underside. The female, which is rare, has the same characteristics.

*N. SPEYERI*, Stdgr. MSS.

Of this species, which is intermediate between *N. aceris* and *N. philyra*, Dr. Staudinger has only two specimens from the Ussuri.

*N. LUCILLA*, Schiff. S. V. p. 173; Fab. Mant. 55.

Var. *ludmilla*, Herr.-Schäff. vi. p. 6, t. 546.

Found in many parts of the Amur region.

I have two varieties from Japan, one of which agrees with the European *N. lucilla*, and one with *N. ludmilla*. The two forms, however, seem to run into each other.

*N. ACERIS*, Lepechin, Reise, i. p. 203, t. xvii. figs. 5, 6 (1768-70).

Var. *intermedia*, Pryer.

Found in most localities in Amurland, Japan, and at Ningpo.

I can find no published description of *N. intermedia*; but the type, which was in Mr. Pryer's collection from the Snowy Valley, near Ningpo, appears to be a form of *N. aceris*. The same form also occurs in Japan. It differs from European specimens of *N. aceris* in being darker underneath and having narrower bands; the Japanese specimens I have seen are variable in this respect, and appear to connect the Chinese with the European form; but I doubt the propriety of separating them. Those from North Japan are closest to European specimens.

NEPTIS PRYERI, Butler, Trans. Ent. Soc. 1871, p. 561; Lep. Ex. t. 63; Jans. Cist. Ent. ii. p. 155.

*Limenitis arboretorum*, Oberthür, Et. Ent. ii. p. 24, t. iii. (1876).

Found in Japan by Jonas and Maries, at Ningpo by Pryer, Kiangsi by David, and at Vladivostock by Christoph.

I have no Japanese specimens; but Mr. Janson says that several taken at the foot of Oyama by Jonas, agree perfectly with Oberthür's figure of *N. arboretorum*.

I may say the same of those from Vladivostock in Dr. Staudinger's collection.

N. SANGAICA, Moore, Ann. & Mag. Nat. Hist. ser. 4, xx. p. 47.

Said to be most nearly allied to *N. alompra* from Assam; but the type specimens from Ningpo in Pryer's collection seem to me very near *N. eurynome*, Westw., though distinguished by the absence on both sides of hind wing of the marginal lunules. The intermediate white band is almost obsolete.

N. EURYNOME, Westw. in 2nd edit. Donov. Ins. China, p. 66 (1842).

*Papilio leucothoe*, Donov. Ins. China, t. 35. fig. 3 (1798), nec Cram.

From the Ningpo hills (Pryer).

N. ALWINA, Brem. & Grey, Schm. nördl. China, p. 7, t. i. fig. 4 (1853).

? *Limenitis kæmpferi*, De l'Orza, Lép. Jap. p. 40 (1869).

? *N. excellens*, Butler, Cist. Ent. ii. p. 282 (1878).

Three specimens from Japan in my collection differ but very little from Bremer's figure of *N. alwina*, which comes from Pekin, though the spots on upperside of fore wing are not quite so large or well formed. Two specimens from Chefoo in Dr. Staudinger's collection also come very close to *N. alwina*.

*L. kæmpferi* is probably the same; but the description is obscure. As regards *N. excellens*, Butler, I find that the type of this insect in the British Museum is a paper figure stuck on a pin, the "excellent drawing" from which the species was described (see Cist. Ent. ii. p. 282). I believe specimens have since been received corresponding with this figure; but it seems to me that the practice of describing from figures in such a case as this can only lead to confusion, and that there can be no excuse for it when the specimens from which the figures are taken are believed to exist.

The excellence of a drawing for scientific purposes consists in its likeness to the original, which cannot be known without comparison with the specimen.

JUNONIA LEMONIAS, Linn. Mus. Ulr. p. 277.

Recorded by De l'Orza from Japan.

JUNONIA ALMANA, Linn. Mus. Ulr. p. 272.

In Pryer's collection, from Shanghai.

J. ASTERIA, Linn. Syst. Nat. i. p. 769.

In Pryer's collection from Shanghai.

J. ORITHYA, Linn. Mus. Ulr. p. 278.

Recorded from Japan by Murray.

VANESSA LEVANA, Linn. Syst. x. p. 480.

Var. *prorsa*, Linn. Syst. Nat. x. p. 480.

Ab. *porima*, Ochs. i. 1, p. 134.

*Araschnia fallax*, Jans. Cist. Ent. ii. p. 271 (1878).

This species occurs in both its spring and summer forms in various parts of the Amur region, *V. levana* having been taken in June, and both forms at Raddefskaia by Christoph. I have also seen what I believe to be a form of the same species in Dr. Staudinger's collection from some part of North China; and, if I am correct in referring *V. fallax* to this species, it is also found in Japan. Mr. Janson says that Mr. Jonas finds *V. burejana* and *V. fallax* in Japan at the same season and in different localities, and infers from this that it cannot be a form of *V. burejana*, to which he considers it most nearly allied. In fact it is hardly distinguished from some European specimens of the form known as *V. porima*, which is believed to be the produce of pupæ of *V. levana* which from some cause have been checked in their development; and Dr. Staudinger tells me that this variety can be bred by exposing the pupæ to cold.

*V. fallax* differs from *V. porima* only in having the transverse band rather more yellow in colour; and it may possibly be a single-brooded Japanese form of *V. levana*. The Chinese specimens, though much larger, come nearer to the Japanese than to the Amur form.

Blanchard, in 'Comptes Rendus Acad. Sciences,' 1871, p. 810, mentions *Vanessa prorsa* as being found by Abbé David in E. Thibet, and also names *Vanessa prorsoides* and a variety *levanoides*, which he says differ from *V. prorsa* and *V. levana* in being larger.

V. BUREJANA, Brem. Lep. Ost-Sib. p. 15, t. i. fig. 8.

*Araschnia strigosa*, Butler, Journ. Linn. Soc., Zool. ix. p. 54 (1866).

This species is found in most parts of the Amur region, and less commonly in Japan.

I think there is little doubt of the identity of *V. strigosa*, though I have seen but few specimens of the Japanese insect.

#### V. L-ALBUM.

Only seen from the Ussuri and from Japan, where it seems rare. The Japanese insect seems intermediate between the European and the American form known as *j-album*; but probably the latter is not really separable. Mr. Strecker says (in his Catalogue, p. 133) that the European and American forms cannot be separated.

VANESSA C-ALBUM, Linn. Syst. Nat. x. p. 477.

*V. fentoni*, Butler, Cist. Ent. ii. p. 281 (1878).

*V. hamigera*, Butler, Ann. & Mag. Nat. Hist. ser. 4, xix. p. 92.

*V. c-album*, Strecker, Cat. Amer. Lep. p. 130.

I have little doubt that the supposed species described as above are only varieties of *V. c-album*; at least it will require much better evidence than we have to prove the contrary. The Japanese specimens which I have seen are variable in the colour of the underside, but not more so than European and American specimens. Butler says that *V. fentoni* is nearest to *V. satyrus*. I have a series of specimens from Washington Territory supposed to belong to four or five distinct species, but which seem to me to be all forms of one, which, until the confusion which exists in this difficult group is cleared up, I prefer to call *V. c-album*. Some of them with greenish underside agree with a Japanese specimen; and I have a specimen of *V. c-album* from Norway very black below, agreeing with others, which are called by American collectors *V. satyrus*. A specimen from Zurich agrees with what I had from Mr. Janson as *V. fentoni* in all important characters. The species seems not common, but occurs in Central Japan and Amurland.

V. C-AUREUM, Linn. Syst. Nat. ed. xii. p. 778.

*V. angelica*, Cr. t. 388; Jans. Cist. Ent. ii. p. 271.

I need not go into the much-argued question as to the correct name of this, but am disposed to think that as Linnæus's description is applicable, and he distinctly says it is from Asia, we may take his name in preference to that of *V. angelica*, Cr.

The species is common in Japan and China, but has not yet been found in the Amur region.

V. FRYERI, Janson, Cist. Ent. ii. p. 269 (1878).

This, though allied to the last species, is, I think, clearly distinct. It is brownish or chocolate below, with the L-shaped mark on the hind wings large and distinct, whilst *V. c-aureum* is always of a paler yellowish colour below.

V. URTICÆ, Linn. Syst. Nat. x. p. 477.

Occurs uncommonly in Amurland and Japan, if, as I believe, the variety which Mr. Fenton calls *V. butleri*, MSS., is the same. Those I have seen from Raddefskaia have the hind part of fore wing and basal two thirds of hind wing much suffused with black.

V. CALLIRHOE, Fab. S. E. 473 (1775).

*Papilio atalanta indica*, Herbst, t. 180. fig. 12 (1794).

Occurs in Japan, China, and Amurland.

V. CARDUI, Linn. Syst. Nat. x. p. 475.

Occurs in Amurland and Japan, doubtless also in China.

VANESSA 10, Linn. Syst. Nat. x. p. 472.

Seen from Raddefskaia, Askold, and Japan.

V. CHARONIA, Drury, Ex. Ent. i. t. 15 (1773).

Var. *glauconia*, Motsch. Et. Ent. ix. p. 28 (1860).

I have not seen this; nor is it recorded from the Amur; but it is common in Japan and China. The form described as *V. glauconia* by Motschulsky has the spot on the fore wing pale or whitish in colour; but I have Sikkim specimens almost as pale, though, as a rule, the Japanese can be distinguished from Indian specimens.

V. XANTHOMELAS, Schiff. S. V. p. 175, n. Cat.

Common in Japan, and in all localities where collections have been made in Amurland.

V. ANTIOPA, Linn. Syst. Nat. x. p. 476.

Occurs in Japan and Amurland, but apparently not common.

MELITÆA MATURNA, Linn. Syst. Nat. x. p. 480.

*M. matura*, var. *intermedia*, Mén. Schrenk's Reise, p. 22, t. ii.

*M. intermedia*, Bremer, Lep. Ost-Sib. p. 12.

Found at Khotoum by Maack, and at Schilka by Radde.

I have seen two specimens from the Ussuri in Dr. Staudinger's collection, which he considers the same as the European *M. matura*, though larger.

M. AURINIA, Rott. Naturf. vi. p. 5 (1775).

Found at Blagovestchensk by Hedemaun, and at Schilka by Radde. It is, however, rare in Amurland.

Var. SIBIRICA, Stdgr. Cat. p. 17 (1871).

This variety, found on the Upper Amur by Hedemaun, somewhat resembles the variety *defontainesii* of Godart. Judging from the specimens I have seen, it can hardly be called "*pallidissima*."

M. DIDYMA, Ochs. Schm. Eur. i. 1, 30 (1807).

Var. *didymoides*, Ev. Bull. Mosc. 1847, iii. p. 67, t. figs. 3, 4.

Ab. ♀ *latonigena*, Ev. loc. cit. p. 66, figs. 1, 2.

I have seen specimens of *M. didyma* from Raddefskaia and Baranofsky; also of the form *M. didymoides*, which Dr. Staudinger considers identical with *M. latonigena* from the Amur. De l'Orza includes this species in his list of Japanese Lepidoptera; but I have seen nothing which could be mistaken for it from Japan as yet.

M. DICTYNNA, Esp. t. 48. fig. 2 a, b (1779).

Var. *protomedia*, Mén. Schrenk's Reise, p. 23, t. ii. figs. 6, 7.

Dr. Staudinger considers *M. protomedia* to be only the Eastern form of *M. dictynna*. It seems common at most places in the Amur region and variable, some of the specimens being hardly distinguishable from the European *M. dictynna*.

*MELITÆA ARCESIA*, Br. Lep. Ost-Sib. p. 15, t. i. fig. 7.

Of this form, which Dr. Staudinger considers a good species, I have seen specimens from Raddefskaia (*Christoph*). It appears to be more common in Dahuria, where it was discovered by Radde.

*M. PHÆBE*, Schiff. S. V. p. 179.

Var. *sibirica*, Stdgr. MSS.

Var. *ætheria*, Ev. Lep. Ross. p. 73, t. ix.

*M. scotosia*, Butler, Cist. Ent. ii. p. 282 (1878).

The forms of *M. phæbe* found in Amurland are variable, but agree in being larger and darker than European specimens. It occurs at Pekin (*Bremer*) in the forms figured by Ménétrés as *M. melanina*, also in North China (*Ehrenkö nig*), whence I have seen specimens in Dr. Staudinger's collection, also in Japan under the name of *M. scotosia*, agreeing with Amur specimens very fairly.

Bremer does not distinguish it from *M. phæbe*; but all the oriental specimens I have seen are large and brightly coloured.

*M. TRIVIA*, Schiff. S. V. p. 179.

According to Ménétrés and Bremer this species was found on the Amur by Schrenk, and at Bureija by Radde; but Dr. Staudinger has seen none from the Amur region.

*M. ATHALIA*, Rott. Naturf. vi. p. 5 (1775).

Var. *dubia*, Stdgr. MSS.

Var. *orientalis*, Stdgr. MSS.

*M. niphona*, Butler, Cist. Ent. ii. p. 281 (1878).

The forms of *M. athalia* found in Eastern Asia are somewhat different from the European ones; but the Japanese *M. niphona* is like those from Askold. The variety *M. orientalis* from the Ussuri differs, in the female sex, in having whitish instead of yellowish spots beneath. The variations, however, in the *Melitææ*, as in many insects, are hardly to be described in words, and can only be understood when seen. Even then the genus is an extremely puzzling one, and requires an immense series of specimens to illustrate it<sup>1</sup>.

*M. AURELIA*, Nick. Syn. Lep. Böhm. p. 12 (1850).

Dr. Staudinger has specimens of this from Ussuri and Raddefskaia, and considers them distinct from the following.

*M. PLOTINA*.

*M. britomartis*, var. *plotina*, Brem. Lep. Ost-Sib. p. 14, t. iii. fig. 2.

Found at Raddefskaia and on the Ussuri, with the last, to which it comes nearest, though constantly differing in the pattern of the upper surface. It seems to me, however, to be very close to *M. aurelia*.

<sup>1</sup> Mr. Strecker has received a variety of *M. athalia* from Corea.

*MELITEA MACULATA*, Br. & Grey, Schmett. nördl. China, p. 7, t. i. fig. 3 (1853).

*Argynnis leopardina*, Lucas, Ann. Soc. Ent. France, 1866, p. 221, t. iii.

This curious insect seems to be the type of a new genus. Lucas says it forms a transition between *Argynnis* and *Melitea*; but I have not seen specimens good enough to enable me to form an opinion. It has been found at Peking only by Bremer and David. One specimen is in Pryer's Chinese collection, without indication of locality. Lucas figures both sexes, and says that the female differs in having the wings more rounded, the spots lighter, and the colour less brilliant. It is extremely rare in collections.

*ARGYNNIS NIPHE*, Linn. Syst. Nat. xii. p. 785.

Seems rare in Japan, but commoner at Shanghai (*Pryer*).

*A. CHILDRENI*, Gray, Zool. Misc. p. 33 (1831).

Never seen by me; but Felder says that he received one female, larger and brighter than Indian specimens, from Ningpo.

*A. SELENIS*, Eversm. Bull. Mosc. 1837, i. p. 10.

Specimens from Raddefskaia do not quite agree with those from South Russia in Dr. Staudinger's collection. It has not been found in China, though recorded by Motschulsky from Japan.

*A. SELENE*, Schiff. S. V. p. 371 (1776).

Specimens from the Amur and Ussuri agree perfectly with European ones, though usually somewhat larger.

*A. OSCARUS*, Eversm. Bull. Mosc. 1844, iii. p. 588, t. xiv.

From Raddefskaia and Vladivostock. This appears to be most nearly allied to *A. euphrosyne*; but differs constantly from it in the absence of the silver spot on the middle band of the hind wing beneath. It is very rare at present in collections<sup>1</sup>.

*A. ANGARENSIS*, Ersch, Bull. Mosc. 1870, i. p. 1.

Of this species I have only seen a single specimen in Dr. Staudinger's collection from Raddefskaia. The species, described as *Melitea amphilocheus*, Mén. Schrenk's Reise, p. 21, t. ii., has never been seen by Dr. Staudinger, who thinks it may probably be a variety of the last.

A specimen in Mr. Janson's collection from Japan is also nearly allied, but may belong to a new species.

*A. FREIJA*, Thunb. Diss. Ent. ii. p. 34, fig. 14 (1791).

Found at Schilka and Raddefskaia. The Amur specimens are more like the Labrador than the Lapland form.

*A. THORE*, var. *BOREALIS*, Stdgr. Cat. i. p. 9 (1861).

From the Ussuri and Raddefskaia. Much paler than European specimens.

<sup>1</sup> Mr. Strecker has a species from Corea which is near *A. selene* and nearer to *A. myrina*, but which is neither *A. oscarus* nor *A. selene*. The black marks are all very large, but with no tendency to confluence.



ARGYNNIS DAPHNE, Schiff. S. V. p. 177 (1776).

*A. daphne*, Butl. Journ. Linn. Soc., Zool. ix. 1866; Lucas, Ann. Ent. Soc. France, 1866, p. 220.

*A. rabdia*, Butl. Ann. Nat. Hist. ser. 4, xix. p. 93.

Found at Pekin (*David*), Raddefskaia, Hakodadi, and Central Japan. It differs from the European *A. daphne* in being usually larger, darker, and, according to Mr. Butler, in having the outer margin of the fore wings concave rather than convex. He says that the palpi are also longer; but it appears to me that there is no reason for separating it as a species; and Dr. Staudinger concurs in this opinion. It appears to vary in the East as it does in Europe; and Mr. Butler himself says that the Hakodadi specimens are closer to *A. daphne* than those from Central Japan.

A. INO, Esp. t. lxxvi. fig. 1 a, b (1782).

Common in most localities where collections have been made in Amurland, and varies remarkably in size, some specimens being one half larger than others. De l'Orza quotes it from Japan; but I have seen nothing resembling it as yet from there.

A. AGLAIA, Linn. S. N. x. p. 481.

?*A. fortuna*, Jans. Cist. Ent. ii. p. 154 (1877).

Common at Askold, Vladivostock, and Baranofsky, and also found in Japan if I am right in uniting *A. fortuna* with it. I was disposed to consider this as a distinct species; but the characters on which Mr. Janson relies are broken down on comparison with the fine series in Dr. Staudinger's collection. I have also seen *A. aglaia* in the Atkinson collection from Kashmir. The Amur specimens are larger than the average of European ones; but this does not seem to be the case in the few Japanese specimens I have seen<sup>1</sup>.

A. ADIPPE, Linn. Syst. Nat. xii. p. 786.

Var. *chlorodippe*, Herr.-Schäff. vi. p. 5.

*A. pallescens*, Butl. Cist. Ent. i. p. 164 (1873).

*A. vorax*, Butl. Trans. Ent. Soc. 1871, p. 403; Lep. Ex. t. liv.

Var. *nerippe*, Feld. Wien. ent. Mon. vi. p. 24 (1862).

*A. locuples*, Butl. Ann. & Mag. Nat. Hist. ser. 5, vii. p. 134.

Var. *cleodoxa*, Ochs. iv. p. 118.

This very variable species has been described under a number of different names, one of which, I think (*A. nerippe*, Feld.), may be considered a well-marked variety or species. It occurs commonly in every part of this region where collections have been made. In China and Japan the variety *A. nerippe*, which is larger and brighter, most distinctly spotted with chocolate on the hind wings beneath, is found with it. Specimens from Japan (*A. pallescens*, Butl.) agree

<sup>1</sup> Mr. Strecker has received an *A. aglaia* from Corea which does not quite agree with Amur or European specimens. From the same place he has an exact transition form between *A. adippe* and *A. nerippe*, belonging as much to one as the other; two male specimens look at first like females, from the very broad round wings.

well with those from the Amur. The larger and brighter varieties agree with those from the Taurus (var. *taurica*, St McGr.). The type of *A. vorax* from Shanghai which I have examined is undistinguishable from some Askold specimens; but other specimens from Askold are without silver spots beneath, like the European var. *cleodoxa*. Felder says that *A. nerippe* may be distinguished from *A. chlorodippe* by the wings being less dentate and by the marginal markings; but I should find it impossible at present to define any of these forms in such a way as to include all the intermediate ones. The females of *A. nerippe* differ more from the males than in the other varieties, and have a whitish mark on the costa near the apex of the fore wing.

ARGYNNIS ANADYOMENE, Feld. Wien. ent. Mon. vi. p. 25 (1862).

*A. ella*, Brem. Lep. Ost-Sib. p. 94, t. viii. fig. 1 (1864).

Seems to be common in Amurland and Japan, and occurs at Ningpo.

*A. PAPHIA*, Linn. Syst. Nat. x. p. 481.

*A. paphioides*, Butl. Ann. & Mag. Nat. Hist. ser. 5, vii. p. 134.

Except that it is generally larger and the females rather darker in colour, there is no difference between the Japanese form described by Mr. Butler as *A. paphioides* and European specimens. It is common also in Amurland; but I have seen no specimens from China.

*A. SAGANA*, Doubl. Gen. t. xxiv. fig. 1, ♂ (1850).

*A. paulina*, Nordm. Bull. Mosc. 1851, iv. p. 440, t. xii. figs. 1, 2, ♀.

Found in Amurland, Japan, and China, and does not vary as far as I have seen. The female, as is now well known, is very different in colour from the male, and quite unlike any other species of *Argynnis*.

*A. LAODICE*, Pall. Reise, i. p. 470 (1771).

Var. *japonica*, Mén. Cat. p. 152, t. x.

Common in Amurland, Japan, and China. Usually larger than Russian specimens, and, if the form figured by Ménétrics were constant in Japan, easily distinguished from it by the colour of the underside. It varies, however, too much, I think, in this respect to be looked upon as more than a local variety.

*A. RUSLANA*, Motsch. Bull. Mosc. 1866, iii.

*A. lysippe*, Janson, Cist. Ent. 1877, p. 164.

This species comes very near the last; but may be distinguished by the shape of the fore wings, which are longer and less rounded than in *A. laodice*. There is also a good structural character shown me by Dr. Staudinger—namely, that three of the median veins of the fore wing in the male are dilated as in *A. paphia*, whilst in *A. laodice* only two are similarly developed. It is found at Raddefskaia, Askold, and Japan, the specimens agreeing perfectly together.

DANAIS TYTIA, Gray, Lep. Ins. Nep. p. 9, t. ix. fig. 2.

Found at Askold by Jankowsky, at Shanghai by Pryer, and in Japan.

DANAIS CHRYSIPPUS, Linn. Mus. Ulr. p. 263 (1764).

Found in China and Japan, but not, as far as I know, in Amurland.

*Danais limniace* is found at Foochow, and may extend further north; but I have seen no specimens from Shanghai or Ningpo.

THAUMANTIS HOWQUA, Westw. Trans. Ent. Soc. 1851, p. 174.

*Stichophthalma howqua*, Feld. Wien. ent. Mon. vi. p. 27 (1862).

This splendid species is found at Shanghai and Ningpo, and also in Formosa. It is the only representative of the *Morphidæ* occurring within my limits, though *Clerome eumæus* occurs in South China.

DEBIS EUROPA, Fabr. Syst. Ent. p. 500 (1775).

Occurs at Kiukiang (*Maries*), and possibly elsewhere. A specimen in the Hewitson collection from Amoy resembles the variety *nilgherriensis*, Guér.

MELANITIS LEDA, Linn. Syst. Nat. i. p. 773 (1767).

Found in Nikko, Japan, by *Maries*, and in Formosa; but I have seen no specimens from Central or North China.

MELANARGIA (ARGE) HALIMEDE, Mén. Schrenk's Reise, p. 37, t. iii. figs. 6, 7.

Var. *meridionalis*, Feld. Wien. ent. Mon. vi. p. 29 (1862).

The type form of this distinct species is found commonly at Askold and elsewhere in Amurland. It occurs also at Moupin in East Tibet, according to Oberthür, in a paler form. At Shanghai and Ningpo is found the curious melanism described by Felder as *M. meridionalis*, four specimens of which, in Pryer's collection, though varying in the intensity of their blackness, are all remarkably different from the northern form.

MYCALESIS GOTAMA, Moore, Cat. Lep. E.I. C. i. p. 232 (1857).

*Sadarga gotama*, Moore, Trans. Ent. Soc. 1880, p. 158.

Found in Japan and China, where it seems common at Shanghai. Specimens from Silhet in the British Museum, marked "*ostrea*, Westw.," agree nearly with this, but are rather larger.

M. PERDICCAS, Hew. Ex. Butt. iii. *Myc.* t. iii. fig. 15 (1862).

*Gareis perdiccas*, Moore, Trans. Ent. Soc. 1880, p. 157.

? *M. sangaica*, Butl. Ann. Nat. Hist. ser. 4, xix. p. 95.

*Martanda sangaica*, Moore, Trans. Ent. Soc. 1880, p. 169.

This species is distinguished from the last by the band on under-side of wings having a blue-grey instead of a yellowish tinge.

It seems common at Shanghai and in Japan.

Specimens in the British Museum from Nankow Pass, between China and Mongolia, seem to belong to this species; and I am doubtful as to separating *M. sangaica*, the type of which from Shanghai I have seen. This species, however, is considered distinct,

and placed in a different genus by Moore in his recent paper on the genus.

*YPHTHIMA BALDUS*, Fab. Syst. Ent. p. 323 (1793).

? *Y. argus*, Butl. Journ. Linn. Soc., Zool. ix. p. 56 (1866).

I follow Dr. Staudinger in considering the common Amur species as *Y. baldus*, Fab., though in such a genus it is difficult to be sure. I think there is little doubt that the Japanese *Y. argus* is identical with the Amur insect, though the underside, as a rule, is paler.

It appears to be common in Japan.

*Y. MOTSCHULSKYI*, Brem. & Grey, Schmett. nördl. China, p. 8 (1853).

*Satyrus motschulskyi*, Mén. Cat. Mus. Petr. t. vi. fig. 5.

Distinguished from the last by having one ocellus on the upper-side of hind wing instead of two or three, and three on the underside, of which that at the anal angle is double. It is extremely near to, if not identical with, *Y. naredu*, Moore, from the N.W. Himalaya. Specimens referred to this latter species are in Dr. Staudinger's collection from Japan; and a Himalayan specimen referred to *Y. motschulskyi* is in the British Museum. It occurs also at Pekin; and a very similar, though smaller form, is in Pryer's collection from Shanghai.

? *Y. AMPHITHEA*, Mén. Schrenk's Reise, p. 41, t. iii. fig. 10.

Nothing is known of this species except Ménétriés's figure and description, based on a single specimen from the Amur. I very much doubt whether it can be recognized in life.

*Y. ZODIA*, Butl. Trans. Ent. Soc. 1871, p. 402.

A small species with the underside of the hind wings very pale, and the ocelli reduced to mere points. It comes very near *Y. methora* from India, and is perhaps hardly separable. It is found in the Snowy Valley, hills of Ningpo, whence I have three specimens collected by Pryer.

*Y. evanescens*, Butl. Ann. & Mag. Nat. Hist. ser. 5, vii. p. 134, from Nikko, Central Japan, seems to be a mere synonym of this—though, as it is described from a single specimen, it is impossible to say with certainty. It is described as resembling "*Y. lisandra*, Cr., above, and *Y. zodia* beneath; the ocelli arranged as in *Y. stellera*."

*Y. MEGALOMMA*, Butl. Cist. Ent. i. p. 236 (1874).

This really does seem to be a good and distinct species, easily known from any I have seen by its shape and large ocelli.

Discovered by Pryer on the Ningpo hills.

*PALÆONYMPHA OPALINA*, Butl. Trans. Ent. Soc. 1871, p. 404; Lep. Ex. p. 86, t. xxxiii. fig. 3.

This genus appears to be peculiar to Central China. It was discovered by Pryer at the same time and place as the last (see Ent. Month. Mag. 1877, p. 53).

*EREBIA MEDUSA*, Schiff. S. V. p. 167 ; Fab. Mant. 40 (1787).

A single specimen in Dr. Staudinger's collection is all I have seen of this species, which was not found by Radde or Schrenk in Amurland. This one was collected by Hedemann, probably between Schilka and Blagovetschensk, and agrees with European examples.

*E. PARMENIO*, Böb. Nouv. Mém. Mosc. ii. p. 306 (1809).

This species somewhat resembles *E. afra*, Esp., beneath, but has very differently shaped wings. It was found on the Amur by Maack, and at Schilka by Radde.

*E. SEDAKOVII* (Ev.), Bull. Mosc. 1847, ii. p. 70, t. i. figs. 5, 6.

*E. niphonica*, Jans. Cist. Ent. ii. p. 153, t. v. fig. 5 (1877).

I have compared Japanese specimens from Mr. Janson with some of *E. sedakovii* in Dr. Staudinger's collection, and find that they are the same. It occurs on Mount Assamayama at 7000 feet, and in Nikko. Radde found it on the Apfelgebirge, and Hedemann at Habarofka. It is more nearly allied to *E. æthiops*, Esp. (*Medea*), than to *E. stygne*, with which Janson compares it.

*E. DISCOIDALIS*, Kirby, Faun. Bor.-Amer. p. 298, t. iii. figs. 2, 3.

This species, though hardly coming within the limits of my present work, is recorded by Ménétrics as having been found by Maack at Oujan, on the Sea of Ochotsk. I have specimens of it from Mr. H. Strecker, taken at Fort York, British Columbia, and also from Hudson Bay, through Herr Möschler. They agree very well together, and appear most nearly allied to *Erebia glacialis*, Esp., though very different on the underside.

*E. CYCLOPIUS*, Ev. Bull. Mosc. 1844, iii. p. 590, t. xiv. fig. 3 *a*, *b*.

*E. cyclopides* (laps. cal.), Brem. Lep. Ost-Sib. p. 19.

Found at Raddefskaia, Blagovestchensk, Schilka, and elsewhere in Amurland. This, with the next three or four species, form a group of large dark-coloured *Erebiæ* peculiar to North-eastern Asia.

*E. TRISTIS*, Brem. Bull. Acad. 1861, iii.

*E. wanga*, Brem. Lep. Ost-Sib. p. 20, t. ii. fig. 1.

Bremer changes the name *E. tristis*, which he had first given to this insect, as it had previously been applied by Herrich-Schäffer; but as his *E. tristis* (t. 387-390) is a synonym of *E. eriphyle*, Freyer, it can be retained for the present species. It seems to be common on the Amur, and is found in the Bureija Mountains.

*E. SAXICOLA*, Oberthür, Et. Ent. ii. p. 32, t. iv. fig. 1.

Found by Abbé David on the Ourato Mountains, Mongolia. Seems to be allied to *E. tristis*, but distinct.

*E. ERO*, Brem. Lep. Ost-Sib. p. 20, t. xi. fig. 2.

Found by Radde on the Apfelgebirge. Allied to *E. disa*, but differs in having the underside spotted with white.

*EREBIA EDDA*, Mén. Midd. Reise, t. iii. f. 2 (1851).

Found at Schilka by Radde. Of the same group as *E. tristis*, to which it is allied; but the ocelli differ in colour.

*E. AJANENSIS*, Mén.

*E. ligea*, var. *ajanensis*, Mén. Cat. Mus. Petr. 104.

*E. eumonia*, Mén. Schrenk's Reise, p. 34, t. iii. fig. 4.

Of this species, which was taken at Hadshi, on the coast of Manchuria, in lat. 49°, and at Nikolaiefsk, I have seen no specimens; but, from the plate, it is evidently nearly allied to *E. ligea*.

*E. EMBLA*, Thunb. Diss. Ent. ii. p. 38, t. viii. fig. 8 (1791).

Does not occur in Amurland, but was found on the Sea of Ochotsk by Maack.

*CENEIS*(= *CHIONOBAS*) *SCULDA* (Ev.), Bull. Mosc. 1851, i. p. 612.

Found by Hedemann on the Upper Amur, but not included in Ménétrici's or Bremer's works. A species, or perhaps a variety of this, is in Dr. Staudinger's collection, collected by Hedemann.

*C. JUTTA*, Hb. t. 914-5.

Found by Maack, according to Bremer, on the south side of the Amur, but not seen by Dr. Staudinger.

*C. URDA* (Ev.).

*Hipparchia urda*, Ev. Bull. Mosc. 1847, ii. p. 69, t. ii. figs. 1-4.

*Chionobas nanna*, Mén. Schrenk's Reise, p. 38, t. iii. fig. 5.

Seems not uncommon at Blagovestchensk, Raddefskaia, and elsewhere in Amurland.

*C. MONGOLICA*, Oberthür, Et. Ent. ii. p. 31, t. iv. fig. 6 (1876).

Found in the mountains of Eastern Mongolia by Abbé David. Seems very nearly allied to *C. tarpeia*.

*SATYRUS DRYAS*, Scop. Ent. Carn. p. 153 (1763).

*S. bipunctatus*, Motsch. Et. Ent. ix. p. 29.

Var. *sibirica*, Stdgr. Cat. p. 29.

Found in the Bureija Mountains, and common on the coast-region of Amurland; also common in Japan. The Japanese form agrees very fairly with European examples, though generally larger and more strongly marked.

The form found at Askold is the var. *sibirica*, Stdgr., and differs, as a rule, in having the markings of the underside almost obsolete.

The form described as *S. bipunctatus* by Motschulsky I presume to be merely an aberration of *S. dryas*, with two spots on the hind wings. I have seen one or two specimens which have them.

*PARARGE ACHINE*, Scop. Ent. Carn. p. 156 (1763).

*P. achinoides*, Butl. Cist. Ent. ii. p. 283 (1877).

Found at Baranofsky, Raddefskaia, and Askold, also in Japan.

The Japanese form *P. achinoides*, Butl. (though this name should perhaps be ignored, as having been given to a drawing), is not materially different from Amur or European specimens, though it usually has larger ocelli.

PARARGE DEIDAMIA (Ev.), Bull. Mosc. 1851, i. p. 617.

*P. ménétriéii*, Brem., Mots. Et. 1852, p. 59; Brem. & Grey, Schmett. nördl. China, p. 8; Mén. Cat. Mus. Petr. t. vi. fig. 4.

Found in Amurland at Raddefskaia, also in North and Central Japan, and at Chefoo by Pryer. A female specimen from Japan agrees very well with Ménétrié's figure.

*P. MAACKII*, Brem. Lep. Ost-Sib. p. 22, t. iii. fig. 2.

*Lasionmata marginalis*, Motsch. Bull. Mosc. 1866, i. p. 190.

From Ussuri and Baranofsky in Amurland; found also at Tokio, Japan, by Fenton.

EPINEPHELE HYPERANTHUS, Linn. Syst. Nat. x. p. 471.

Common in Amurland, where the type is larger, with larger spots than in Europe. At Askold, however, it agrees very well with the French type, according to Oberthür. It is included by Murray in his list of Japanese insects; but I do not know on what authority.

LASIONMATA BREMERI, Feld. Wien. ent. Mon. vi. p. 28 (1862).

Described from Ningpo. I have never seen a specimen of this species.

LETHE SYRCIS, Hew. Ex. Butt. iv. *Del.* t. iii. figs. 13, 14; Oberthür, Et. Ent. vi. t. vii. fig. 3.

This species appears not uncommon in Central China. I have specimens from Ningpo; and it occurs at Shanghai (*Swinhoe*) and at Kouytcheou (*Largeveau*).

*L. LANARIS*, Butl. Ann. & Mag. Nat. Hist. ser. 4, xix. p. 95.

The type of this species, which I have seen, is from the Ningpo hills, and what I believe is the same species is in the Hewitson collection from Amoy.

*L. SATYRINA*, Butl. Trans. Ent. Soc. 1871, p. 402.

The male of this species is in Mr. Godman's collection from Chekiang; and the female is in the British Museum. It seems to be a form intermediate between *Lethe* and *Mycalopsis*.

*L. EPIMENIDES*, Mén. Schrenk's Reise, p. 39, t. iii. figs. 8, 9.

*Neope fentoni*, Butl. Ann. & Mag. Nat. Hist. ser. 4, xix. p. 91.

Not uncommon in various parts of the Amur region, and also found in Central Japan. I see no difference of importance between them.

A variety of this species is distinguished as var. *epaminondas*, Stågr. MSS., from Raddefskaia, Baranofsky, and Blagovestchensk. It differs in its smaller size and more yellowish tint.

Butler says "there can be no question that whereas the male of *L. epimenides* figured by Ménétériés is a *Pararge*, the female is a *Neope* near *N. gaschkevitschii*, and is nearer to *Neope callipteris* than to the male associated with it." I can only say that the figures in question are very faithful ones of the two sexes as sent me by Dr. Staudinger; and if there can be no question that they belong to different genera, as Mr. Butler thinks, the sooner the two genera are united the better.

*LETHE SICELIS*, Hew. Ex. Butt. iii. *Deb.* t. i.

Found in the Ningpo hills by Pryer and in Japan, though seemingly not common.

*L. (PRONOPHILA) SCHRENKI*, Mén. Schrenk's Reise, p. 33, t. iii. fig. 3.

Of this fine species I have specimens agreeing very well from Raddefskaia and other parts of Amurland, and from Central Japan. It was found also in Yesso by Maries. It seems to belong to the same genus as *L. epimenides*.

*L. DIANA*, Butl. Journ. Linn. Soc., Zool. ix. p. 55 (1866).

Common in Central Japan.

*L. WHITELYI*, Butl. Ann. & Mag. Nat. Hist. ser. 3, xix. p. 403, t. ix. fig. 8.

From various parts of Japan. The markings are similar to the last; but the whole insect is darker.

? *L. CONSANGUIS*, Butl. Ann. & Mag. Nat. Hist. ser. 5, vii. p. 133.

I think that this, of which I have seen the type, is only a variety of the last. It differs in the brighter zones of the ocelli.

*NEOPE GASCHKEVITSCHII*, Mén. Cat. Mus. Petr. p. 121, t. x. fig. 4 (1855).

Common in Japan, but not found in Amurland to my knowledge. Felder says it occurs at Ningpo.

A variety or species is described as *N. nipponica*, Butl. Ann. & Mag. Nat. Hist. ser. 5, vii. p. 133. From Tokio.

I am very doubtful whether this can be considered distinct; but if it is, it must bear the name of *N. gaschkevitschii* instead of the commoner form generally known as such; for it agrees exactly with Ménétériés's excellent figure in the points in which *N. nipponica* is said to differ from the common form.

*N. CALLIPTERIS*, Butl. Ann. & Mag. Nat. Hist. ser. 4, xix. p. 92.

370 miles from Tokio (*Fenton*), Nikko (*Maries*).

This species seems to me more nearly allied to *Lethe* than to *Neope*, and, like the next species, is very similar in form and markings to some of the Himalayan *Satyridae*.



NEOPE? MUIRHEADI, Felder, Wien. ent. Mon. vi. p. 28 (Jan. 1862).

? *Debis segonax*, Hew. Ex. Butt. iii. *Debis*, t. i. (June 1862).

? *N. segonacia*, Oberthür, Et. Ent. vii. fig. 4. Kiangsi.

These names all appear to refer to one species, of which three specimens from Ningpo are in Pryer's collection.

TRIPHYSA NERVOSA, Motsch. Bull. Mosc. 1866, p. 189.

I know nothing of this species, and have seen no specimens of the genus from Japan.

T. ALBOVENOSA, Ersch, Horæ Ent. 1877, p. 336.

I have seen typical specimens in Dr. Staudinger's collection from Schilka and Blagovetschensk. There are also two specimens, collected by Hedemann in Amurland, which are intermediate between this species and *T. phryne*, of which perhaps *T. albovenosa* is an extreme development.

CÆNONYMPHA CÆDIPUS, Fab. Mant. 31 (1787).

*C. annulifer*, Butl. Ann. & Mag. Nat. Hist. ser. 4, xix. p. 91.

This species occurs generally in Amurland and also locally in Japan. The only difference worth noticing between Japanese and European specimens is the larger size of the ocelli, which in such a variable species is a character of very slight importance.

C. AMARYLLIS, Cram. Pap. Ex. t. 391.

Found generally in Amurland and also at Chefoo by Pryer, and at Pekin (*vide Bremer*).

I found no specimens in Dr. Staudinger's collection quite agreeing with the figure of *C. rinda*, Mén. Schrenk's Reise, p. 42, t. iv. fig. 1, which is probably taken from a faded specimen. A single one only was taken on the Amur by Maack.

C. HERO, Linn. Faun. Suec. 271.

Found at Raddefskaia and on the Ussuri<sup>1</sup>.

Var. PERSEIS, Led. Ver. zool.-bot. Ges. Wien. 1853, p. 360.

Of this larger paler form I have specimens from Amurland. It is found also at Askold.

C. IPHIS, Schiff. S. V. p. 321.

Included by Bremer, who says it was found at the Bureija and Apfelgebirge by Radde; but Dr. Staudinger has never seen specimens from Amurland.

CASYAPA THRAX, L. Syst. Nat. ii. p. 794 (1767); Don. Ins. Ind. t. 49.

One specimen from Foochow (*Pryer*).

<sup>1</sup> Mr. Strecker has specimens from Corea larger, darker below, and with much larger ocelli than European specimens.

*TAGIADES NYMPHALIS*, Speyer, Stett. ent. Zeit. 1879, p. 348.

This fine large species is described from three specimens taken at Vladivostock. Speyer states that it differs slightly from Chinese specimens. The species resembles *Satarupa gopala*, Moore, from Sikkin, in the size, shape, and marking of the fore wings; but the hind wings are very different.

I have seen it from N. China in Dr. Staudinger's collection.

*ISMENE BENJAMINI*, Guér. Deless. Sonn. Inde, ii. p. 79, t. 22.

*I. benjamini*, var. *japonica*, Murr. Ent. Mo. Mag. 1875, p. 4.

Specimens from Japan (*Pryer*) and Ningpo (*Pryer*) agree with each other and hardly vary from the Himalayan insect, though the yellow and black markings on the anal angle below are not usually so bright or conspicuous.

*I. SEPTENTRIONALIS*, Feld. Reise, Nov. p. 525, t. 73. fig. 3 (? 1866).

*I. striata*, Hew. Ex. Butt. v. t. 43. figs. 6, 7 (? 1867).

This species, described from Shanghai (*Muirhead*) and from China (*Hewitson*), I have not seen; but the figures quoted seem to agree very well. The species is easily distinguished from *I. benjamini* by the absence of the anal markings and the banded body. The coloration of its upper surface (not figured by Felder) is nearer that of the following.

*I. AQUILINA*, Speyer, Stett. ent. Zeit. 1879, p. 346.

*I. jankowskii*, Oberthür, Et. Ent. v. p. 23, t. i. fig. 2 (1880).

Vladivostock, Askold (*Jankowsky*); Japan (*Mus. Brit. & Hew.*). The species is plain brown in colour, with pale indistinct patch on the fore wing. It is allied to *I. harisa*, Moore, from Sikkin, though quite distinct.

*HESPERIA? ALEXIS*, Fab., Butler, Fab. Ins. p. 269, t. iii.

A specimen which agrees very fairly with Butler's plate is in Pryer's collection from Shanghai.

The whitish band of hind wing below is very faint, except where it joins the dark spot at anal apex; and the insect closely resembles a specimen from Queensland (*MacLean*) in *Mus. Godman and Salvin*.

*PLESIONEURA CURVIFASCIA*, Feld. Wien. ent. Mon. vi. p. 29 (1862).

From Ningpo (*Muirhead*). Said to be near *P. feisthamelii*, Boisd., from the Moluccas.

*P. BIFASCIATA*, Brem.

*Eudamus bifasciatus*, Br. & Grey, p. 10 (1853).

*Gonoloba bifasciata*, Mén. Enum. t. v. fig. 3 (1855).

A species I know only from the plate. It was found near Pekin (*Bremer*).

*Plesioneura phodicus*, Hew.?

I cannot find any reference to the description of this species, which was so named in Pryer's collection.

From China, without any locality indicated; other specimens are in Godman and Salvin's collection, marked Mongolia.

It is nearly allied to *Satarupa sambara*, Moore, P. Z. S. 1865, p. 781, which has very similar markings, though larger and otherwise distinct.

*PTERYGOSPIDEA MACULOSA*, Feld. Reise Nov. p. 528, t. 73. no. 7 (1867).

Described from Shanghai. In Hewitson's collection this species has been identified with *Plesioneura pulomaya*, Moore, from Sikkim; but Chinese specimens of what I believe is Felder's species differ considerably from *P. pulomaya* in the marking of the hind wings beneath.

*P. SINICA*, Feld. Wien. ent. Mon. vi. p. 39 (1862).

Ningpo.

? *Daimio felderi*, Butl. Ann. & Mag. Nat. Hist. ser. 4, vii. p. 140. Japan (*Maries*).

I do not know whether I am right in uniting these, but the Japanese insect, which I have seen, appears to agree fairly with Felder's description and agrees with an insect from Ningpo in Pryer's collection.

*DAIMIO TETHYS*, Murr.

*Pyrgus tethys*, Mén. Enum. p. 126, t. x. fig. 8 (1855).

*Daimio tethys*, Murr. Ent. Mo. Mag. 1875, p. 17.

*Pyrgus tethys*, Oberthür, Et. Ent. v. p. 24.

Japan (*Pryer*), Askold (*Jankowsky*), N. China (*David*).

Murray creates the genus *Daimio* for this insect, on account of the formation of the antennæ and palpi.

It is common in Japan; and I have also specimens from Askold and N. China. It is very variable in size and in the markings of the hind wings, which in some specimens have an ill-defined transverse white band.

M. Oberthür says he has varieties from North China and Amurland, which I should imagine from the description may be intermediate between this species and the last.

*ANTIGONUS VASAVA*, Moore, P. Z. S. 1865, p. 786.

Described from Darjiling. A single specimen is in Pryer's collection from Shanghai; and it is reported to occur in Japan.

*PAMPHILA MENCIA*, Moore, Ann. & Mag. Nat. Hist. ser. 4, xx. p. 52.

Of this obscure species I have only seen one specimen, from Shanghai, collected by Pryer. Moore says the wings are much broader than in *P. sinensis*, Mabille, and the hind wing not lobed. Of this *P. sinensis* I know nothing, and can find no published description of it.

PAMPHILA MATHIAS, Fabr. Ent. Syst. Suppl. p. 433 (1798); Butl. Cat. Fabr. t. iii. fig. 6.

It is difficult to understand the group of species of which I take this as the type. They are numerous and variable, and their synonymy and distribution most puzzling. A number of supposed species are included in Hewitson's and other collections under the name of *P. mathias*, which, if I have rightly identified it, has a group of transparent spots on fore wing and on the hind wing a group of small ones which do not show on the upper surface.

I have seen it from Shanghai (*Pryer*) and from Japan.

*P. LAMPROSPILUS.*

*Isoteinon lamprospiles*, Feld. Wien. ent. Mon. vi. p. 38 (1862).

*Pamphila vitrea*, Murr. Ent. Mo. Mag. 1875, p. 171.

I believe this identification is correct, though I have not seen Chinese specimens. It is described by Felder from Ningpo, and seems common in Japan. It is distinguished by a group of large transparent spots showing through the fore wing, and by nine small ones showing only on the underside of the hind wing.

? *P. OCEIA*, Hew. Desc. Hesp. p. 31 (1868).

An insect so named in *Pryer*'s collection from Shanghai does not agree with Hewitson's description.

It is of the size and shape of *P. mathias*, with eight transparent spots on the fore wing and a black tuft of hairs on the centre of hind wing, but no spots.

*P. oceia* is described from the Philippines.

*P. VARIA*, Murr. Ent. Mo. Mag. 1875, p. 172.

This species is known by the colour of the underside, which is ochraceous with darker veins. It seems common in Japan; but I have seen no specimens from elsewhere.

*P. GUTTATA.*

*Eudamus guttatus*, Brem. & Grey, Schmett. nördl. China, p. 10 (1855).

*Gonoloba guttata*, Mén. Cat. Mus. Petr. t. v. fig. 4 (1857).

Common in Japan. Found also at Shanghai (*Pryer*) and Pekin (*Bremer*).

It belongs to the group of olive-coloured *Pamphilæ* having transparent spots on the fore and hind wings.

*P. FORTUNEI*, Feld. Reise Nov. t. 72. fig. 11.

From Shanghai. I have not seen this; but, judging from the figure, it is very near *P. guttata*.

*P. PELLUCIDA*, Murray, Ent. Mo. Mag. 1875, p. 172.

Very near the last; but distinguished by the spots of the hind wing being arranged in an alternate line instead of a straight row

as in *P. guttata*. All the specimens I have seen are from Japan, where it seems common.

PAMPHILA JANSONIS, Butl. Cist. Ent. ii. p. 284 (1878).

Mr. Butler says this insect is widely distinct from the last; but the type in the British Museum seems very similar to it, though in some specimens the spots on the hind wings are partly obsolete.

P. CONFUCIUS, Feld. Wien. ent. Mon. vi. p. 29.

From Ningpo (*Muirhead*).

I have not seen this species, which is said to be near *P. augias*, Linn.

HESPERIA SYLVANUS, Esp. t. xxxvi. fig. 4.

? *Pamphila herculea*, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 140.

? *Hesperia subhyalina*, Br. & Grey, p. 10; Mén. Cat. Mus. Petr. t. v. no. 7.

? *Hesperia venata*, Br. & Grey, p. 11; Mén. loc. cit. no. 8.

The forms of *H. sylvanus* found in China, Japan, and Amurland are usually larger than the European ones; but in Dr. Staudinger's opinion we are not justified by our present knowledge in keeping them separate. Specimens of *H. sylvanus* from Astrabad in his collection agree with Ménétrics's figure of *H. subhyalina* and with specimens I possess from Japan and China, also with forms of *H. sylvanus* from Baranofsky and Raddefskaia.

*H. venata*, Brem., as figured, seems to be an aberration of *H. sylvanus*; but may be a distinct species. Dr. Staudinger has a specimen quite like the figure but smaller, collected by Hedemann in Amurland.

I have seen the type of *H. herculea*, which is, I think, a Japanese form of *H. sylvanus*.

H. SYLVATICA, Brem. Lep. Ost-Sib. p. 34, t. iii. fig. 10.

Found in various parts of Amurland and at Tokio.

It is a small species allied to *H. actæon* of Europe, but with paler disks margined with brown and the underside marked with conspicuous dark veins.

Very near it is

H. LEONINA, Butl. Cist. Ent. ii. p. 286 (1878).

According to Mr. Butler, this is "markedly distinct;" but, except that it is brighter in colour and less overlaid with brown, I do not see much to distinguish it.

H. OCHRACEA, Brem. Lep. Ost-Sib. p. 33, t. i. fig. 11.

Allied to the last two, but distinct. I have it from Japan, Askold, and Raddefskaia. Near it is

H. RIKUCHINA, Butl. Cist. Ent. ii. p. 285 (1878).

According to Mr. Butler, "a very distinct species;" but I can

see nothing in his description, or in the specimen which I have of it, to justify this remark.

*HESPERIA LINEOLA*, Ochsen. i. p. 230.

From Ema (*Maack*), and Baranofsky (*Dörries*).

Those seen in Dr. Staudinger's collection agree with European examples.

*H. COMMA*, Linn. Syst. Nat. x. p. 484.

?*Pamphila florinda*, Butl. Cist. Ent. ii. p. 285 (1878). From Japan.

As far as I can judge from the type specimen, this is only a variety of *H. comma*, larger and with the spots indistinct.

Two specimens from Baranofsky and the Amur appear to resemble the Japanese insect, though I have not been able to compare them.

*H. FLAVA*, Murray, Ent. Mo. Mag. xii. p. 4 (1875).

Nearly allied to a species from Sikkim. I have it from Shanghai and Japan.

A specimen in Mr. Janson's collection from Japan, named *P. sunias*, Feld., by Moore, is very near this, and only differs slightly in the markings of the hind wings.

*H. MARO*, Fab. Ent. Syst. Suppl. p. 432.

*Cyclopides maro*, Butl. Cat. Fabr. t. ii. fig. 12.

Specimens from Shanghai in Pryer's collection which are named *Pamphila dara*, Koll., agree fairly with the figure of what Butler considers to be *P. maro*, Fab., from Ceylon. It is allied to *P. dara*, Koll., from the Himalayas, to *P. camertes*, Hew., from Singapore, and *P. mæsa*, Moore.

There is a single specimen, not fresh enough for identification, of a species allied to this, in Mr. Pryer's Shanghai collection. It has the yellow spots on the wings very much smaller.

*CARTEROCEPHALUS PALÆMON*, Pall. Reise, i. p. 471 (1771).

Found by Radde at Bureija, and on the upper Amur by Hede-mann.

*C. SYLVIUS*, Knoch, Btr. t. 5. figs. 1, 2 (1781).

Found at Schilka and Bureija by Radde, and at Raddefskaia by Christoph.

*C. ARGYROSTIGMA*, Evers. Bull. Mosc. 1851, ii. p. 624.

Found at Onon by Radde, and on the upper Amur by Hede-mann.

*CYCLOPIDES MORPHEUS*, Pall. Reise, i. p. 471 (1771).

From Baranofsky and the Ussuri.

*C. ORNATUS*, Brem. Lep. Ost-Sib. p. 33, t. ii. fig. 5.

Seems rare in Amurland, but found by Radde at Bureija, and at

Raddefskaia by Christoph. It is easily distinguished by two silver longitudinal bands on the underside of the hind wing.

CARTEROCEPHALUS UNICOLOR, Br. & Grey, Schmiett. nördl. China, p. 10; Mén. Cat. Mus. Petr. t. v. fig. 6.

This species, found at Pekin, differs from the last in the pale ochreous colour of the underside of the hind wings, on which the silver bands are absent. I have seen several specimens from Japan which appear to me to agree very well with this species, though there is some indication of the silver stripes. They come nearer to *C. unicolor* than to *C. ornatus*.

PYRGUS INACHUS, Mén. Schrenk's Reise, p. 46, t. iv. fig. 2.

Rare in Amurland, whence I have only seen two or three specimens in Dr. Staudinger's collection. Specimens from Japan collected by Jonas agree with it; but two from Shanghai in Pryer's collection differ in the size, shape, and markings. They are not, however, fresh enough to describe.

P. GIGAS, Brem. Lep. Ost-Sib., Nachtrag, p. 96, t. viii. fig. 3.

Of this species, the largest of all the Palæarctic species, I have seen specimens from Askold and Vladivostock. Dr. Staudinger thinks it may possibly be a variety of *P. tessellum*; but it is much larger and darker, and seems sufficiently distinct.

P. SPEYER, Stmgr. MSS.

This species, found at Baranofsky by Dörries, belongs to the group of *P. alveus*. Dr. Staudinger thinks it may be a variety of it, near *P. fritillum*, Hb.

P. CRIBELLUM, Ev. Bull. Mosc. 1841, p. 25.

Specimens in the Hewitson collection from Amurland, and in Dr. Staudinger's collection, vary very slightly from the European form.

P. ALVEUS, Hb. t. 401-3.

One specimen from Blagovetschensk in Dr. Staudinger's collection is considered by him to be the same as *P. alveus*.

P. SERRATULÆ, Ramb. Fn. And. t. viii. fig. 9.

Found at Bureija by Radde; and one specimen from Amurland is in Dr. Staudinger's collection.

P. MALVÆ, Linn. Syst. Nat. x. p. 485.

Found at Bureija by Radde; and two specimens are in Dr. Staudinger's collection from Schilka.

P. ORBIFER, Hb. t. 803-6.

Bremer says it was taken at Bureija by Radde; but Dr. Staudinger has seen no specimens from Amurland.

*Pyrgus cynaræ*, Ramb. Fn. And. t. viii. figs. 4, 5.

Found by Radde on the Onon according to Bremer; but Dr. Staudinger has never seen Amur specimens.

*Syrichthus maculatus*, Br. & Grey, Schmett. nördl. China, p. 11.

*Pyrgus maculatus*, Mén. Cat. Mus. Petr. t. v. no. 5.

*P. sinicus*, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xix. p. 96.

The specimens from Shanghai, described by Mr. Butler as *P. sinicus*, differ somewhat from Amur specimens in having the outer band of spots on the hind wing indistinct or absent. A Japanese specimen is intermediate in these respects. I should have been inclined to look on it as a good local variety or species; but Dr. Staudinger thinks it only an aberration of *S. maculatus*. The latter is common in Amurland.

*Scelothrix zona*, Mab. Bull. Ent. Soc. Fr. 1875, p. cexiv.

Described from specimens collected by David at Pekin, which seem from the description very near *S. maculatus*. I have never seen this insect.

*Nisoniades tages*, Linn. Syst. Nat. x. p. 485.

Found at Schilka and on the Amur by Radde (*vide* Bremer), and mentioned by Bremer from Pekin, but never seen from the Amur by Dr. Staudinger.

*N. montanus*, Brem. Lep. Ost-Sib. p. 31, t. xi. fig. 4.

*N. rusticanus*, Butler, Journ. Linn. Soc., Zool. ix. p. 58 (1866).

Specimens of this species from Askold, Japan, and Shanghai agree very well with each other. The female is distinguished by a pale band across the fore wing.

November 29, 1881.

Dr. A. Günther, F.R.S., V.P., in the Chair.

The following extract was read from a letter addressed to the Secretary by Dr. A. Frenzel, of Freiberg, Saxony:—

“Being informed by my friend Dr. Meyer, of Dresden, that he has mentioned in his communication on *Eclectus riedeli* that I have been endeavouring for some time to induce birds of this genus to breed in my aviary, but without success until recently, I beg to state that since the 31st of October a young *Eclectus* (or young *Eclecti*) have been living in my aviary. I cannot decide whether there is only one or two, because the breeding-box is fastened in such a way that I cannot get to it without disturbing the birds.

“The parents are a green *Eclectus polychlorus* and a red *Eclectus grandis*. The green one, the father, feeds the red one, the mother; and she, again, feeds the young.



"I hope to be able to send you soon a detailed account of this experiment, which is, so far as I am aware, the first successful one, and which will put Dr. Meyer's discovery as to the sexual differences of *Eclectus* beyond any doubt."

The following papers were read :—

1. On a new Species of *Eclectus* from the Timorlaut Islands.

By A. B. MEYER, M.D., C.M.Z.S., Director Royal Zoological Museum, Dresden.

[Received October 18, 1881.]

In a collection of birdskins which Mr. Riedel, the well-known Dutch Resident formerly at Gorontalo and Timor Kupang, and now at Amboina, has recently sent to the Dresden Museum from the islands of Sumba, Timor, and the smaller ones to the east as far as Aru, and on which I hope to be able soon to publish some notes, I immediately perceived, when unpacking them, the skin of a red *Eclectus* which differs from all others known to me.

It may be described thus :—

*ECLECTUS RIEDELI*, sp. nov.

*Fœm.* Capite et collo coccineis; dorso, uropygio, supracaudalibus, tectricibus alarum, remigibus secundariis externe, subalaribus minoribus, pectore et abdomine rubro-puniceis; margine alarum et pogonio externo remigum primariorum cyaneis; subcaudalibus caudæque apice pulchre flavis; cauda supra rubropunicea, subtus flava, basin versus aurorescente; rostro pedibusque nigris. Long. tot. circa 360 millim., al. 220, caud. circa 130, rostri 30 (culmin. 40), tarsi 20.

*Hab.* in ins. Timorlaut: Cera.

Although no sex has been assigned to the specimen by the hunter, I nevertheless, judging from analogy, do not doubt the least that it is the female of a green *Eclectus* which still remains to be discovered; besides, on raising the red feathers, green spots and greenish tints come into appearance here and there.

*Eclectus riedeli* resembles *E. cornelia*, Bp. (P. Z. S. 1849, pl. xi.), with the exception of the tail and under tail-coverts, which are rather those of *E. roratus* (P. L. S. Müll.) female (*E. grandis* auct.), with the difference only that the underparts of the tail are more yellowish than reddish. Its specific difference from the last-named bird is obvious at a glance, there being no violet at all on the back and belly in *E. riedeli*; and the same character distinguishes it from *E. cardinalis* (Bodd.) female, as well as from *E. pectoralis* (P. L. S. Müll.) female (*E. linnæi* auct.), from which last species it stands furthest apart. The red hue of the head differs somewhat from that in all three species named. I cannot compare this hue with that of *E. cornelia*, of which no specimen is within my reach; and as to the

hue of a colour the consultation of a plate is not satisfactory. The red colour of the back agrees rather well with that of *E. cardinalis*. The bill of *E. riedeli* is weaker than those of *E. pectoralis* fem. and *E. roratus* fem., even smaller than that of *E. cardinalis*. *E. riedeli*, therefore, proves to be a well-defined species, in the same sense as the other species of the genus, viz. an insular variation from one and the same stock.

Good luck having put into my hands a new species from a locality which has been suspected to be the habitat of *E. cornelia*, I am obliged to give way concerning my doubts as to the specific value of the last-named bird (see 'Verhandlungen der k.-k. zool.-bot. Gesellschaft zu Wien, 1874, p. 184), and now suppose that its habitat will be somewhere in these eastern parts of the Malay Archipelago. Unfortunately, only one specimen of *E. riedeli* has been sent by Mr. Riedel, and no other *Eclectus* at all from any of the dozen or more islands from which he forwarded specimens. I do not suppose that *E. westermanni*, Bp., is the male of *E. riedeli*, as the size of these two birds appears to differ; but this question can only be decided when actually green specimens arrive from Cera or its close neighbourhood. After this discovery of a red *Eclectus* without blue or violet on the breast, belly, and back, not in captivity, but directly from the forest, I am rather inclined now to look on *E. westermanni* also as a good species (see *l. s. c.*).

The island of Cera, or Cerra, or Sejah, belongs to the Tenimber or Timorlaut group, and is situated on the west of the larger island of Timorlaut, only separated from it by a small sea-arm. The small islands to the west of Timorlaut are celebrated for their tortoise-shell; and therefore dealers from Amboina and Banda go there every year; Cera has about 2500 inhabitants. I mention these data, which are not generally known to ornithologists, in the hope that some one, travelling in the far east, may profit by them and make a trip to Cera from Amboina or Banda.

The species of *Eclectus* which occurs on the nearest island is *E. pectoralis*, on Kei (about 150 miles distant from Cera, the shortest distance between the Timorlaut islands and Kei being only about 90 miles), the female of which (*E. linnaei* auct.) differs most considerably from *E. riedeli*. We now know five forms of red *Eclecti*, which differ from another much more than do the green males—a very interesting fact, showing that, if variation occurs at all in consequence of insular isolation, both sexes are not always liable to it in the same degree. It is to be hoped that we may soon learn more about *E. westermanni*, *E. cornelia*, and *E. riedeli*, and about other links of the chain, if such still exist. The more forms known the more instructive appears the insular variation and the extraordinary sexual diversity of this genus. Thanks to the researches of Dr. Krukenberg of Heidelberg, we now know that the yellow pigment (zoöfulvin) which produces the green colour of the male *Eclecti* is chemically the same as that which gives the yellow colour to the under tail-coverts and the apical parts of the tail of *E. roratus* female (*E. grandis* auct.), and that the red colour of the female

*Eclecti* is produced by the same pigment (ara-red) as the red which adorns the breast of the male *Eclecti* (see Dr. C. Fr. W. Krukenberg, 'Vergl. physiologische Studien,' ii. p. 161 *seq.*, Heidelberg, 1881; and A. B. Meyer, 'Mitth. d. ornith. Vereins zu Wien,' p. 83 *seq.*, 1881)—facts which not only do not contradict the statement that the green and red *Eclecti* sexually belong together, but directly support it. They, besides, give a clue to the occurrence of yellow in the females and of red in the males: in the first case the male influence comes into appearance in the female dress, in the second the female influence in the male dress. Only a partial mixture of colour takes place in *Eclectus*, whereas in the majority of birds the mixture of male and female characters is a more complete one.

But, however this may be, the doubts which some ornithologists still entertain as to the "theory" promulgated by myself in 1874, will finally vanish only after successful breeding-experiments in captivity. Our hopes that this may be soon accomplished are founded on the fact that Dr. Frenzel, of Freiberg in Saxony, has already succeeded twice so far that two couples of young *Eclecti* have been developed in the eggs, ready to emerge, when they died from unknown causes. These four specimens are now preserved in spirit in the Dresden Museum. But Dr. Frenzel informs me that now again his pair (green and red) of *E. pectoralis* are sitting vigorously on fertilized eggs<sup>1</sup>. If he succeeds in rearing up the young ones, we shall have the pleasure of observing the change of plumage from red into green, or of stating that the sexual difference of colour exists from the beginning—a question which is, as far as I see, not yet finally settled,

2. A Note on the Genera *Schænicola* and *Catriscus*. By R. BOWDLER SHARPE, F.L.S., F.Z.S., &c., Department of Zoology, British Museum.

[Received October 21, 1880.]

During the last two years a great deal of interest has been shown in India with respect to Jerdon's *Schænicola platyura*, a little Reed-bird, which was described by him as *Timalia platyura* (Madr. Journ. xiii. p. 170), and was afterwards made the type of the genus *Schænicola* by Blyth (J. A. S. Beng. xxxiii. p. 374). The typical specimen was lost; and the bird remained unidentified for years, merely receiving a short notice, in 1863, from Jerdon in his 'Birds of India' (ii. p. 73). In 1878, however, Mr. Frank Bourdillon met with the species in Southern Travancore, as recorded by Mr. Hume in the 7th volume of 'Stray Feathers' (p. 37). Again, in Capt. Legge's 'Birds of Ceylon,' reference is made to a specimen which had been since 1854 lying undetermined in a box in the British Museum; but Capt. Legge (somewhat inconsistently, in my opinion) only gave it a place in his work in a foot-note. There is not the slightest reason for believing that the specimen in question is not a genuine Ceylonese skin,

<sup>1</sup> See Dr. Frenzel's letter above, p. 916.

as it was purchased by the Museum from Mr. Cuming, who received it doubtless from one of his correspondents, perhaps Mr. Thwaites or Mr. Layard. Anyhow, I have no doubt that the bird occurs in Ceylon, and has escaped observation there, just as it did for so long in India.

In the ninth volume of 'Stray Feathers' several notices of this bird are published. At p. 209 Mr. W. Edwin Brooks, who has made the Warblers of India his especial study, gives a minute account of the generic features of *Schœnicola*, based on the Travancore specimen procured by Mr. Bourdillon (*Mus. A. O. Hume*); and at p. 211, Mr. Hume gives an editorial note, with additional information from Mr. Bourdillon, recording the capture of three more specimens. Two of these have since passed into the collection of the British Museum, and are marked by the collector as "breeding," a statement on which Capt. Butler afterwards comments. At p. 234, Mr. Hume records the capture of a specimen by Captain Butler at Belgaum, and suggests the possibility of *Schœnicola* being identical with the African genus *Catrisicus*. Lastly, at p. 260 of the same volume of 'Stray Feathers,' Mr. Hume gives an excellent résumé of the history of *Schœnicola platyura* as far as known, and Capt. Butler adds some most interesting notes on the nesting of the species at Belgaum. In the space of two years, therefore, this interesting bird has been rescued from the oblivion into which it had fallen, and we now know a good deal about its habits and general economy.

It is with the object of answering Mr. Hume's question as to the possibility of the Indian bird being identical with the African *Catrisicus apicalis*, that I write these few lines. A perception of affinities has been one of Mr. Hume's most noticeable qualities as an ornithologist; and his association of *Schœnicola* with *Catrisicus* turns out to be perfectly correct; but the Indian species is not exactly the same as the African one. The following I believe to be the literary history of the genus, with its two species:—

#### SCHÆNICOLA.

Type.

- Schœnicola*, Blyth, J. A. S. Beng. xiii. p. 374 (1844,  
nec Bp. 1850) ..... *S. platyura*.  
*Catrisicus*, Cab. Mus. Hein. Th. i. p. 43 (1850) .. *S. apicalis*.

#### Clavis specierum.

- a. Saturate rufescenti-brunneus, regione parotica pileo concolori;  
hypocondriis saturate rufescenti-brunneis; subcaudalibus ful-  
vescentibus vel rufescenti-brunneis ..... *platyura*.  
b. Pallide rufescenti-brunneus, regione parotica pallide brunnea;  
hypocondriis fulvescentibus; subcaudalibus nigricantibus pal-  
lide marginatis..... *apicalis*.

#### 1. SCHÆNICOLA PLATYURA.

*Timalia platyura*, Jerdon, Madr. Journ. xiii. p. 170 (1844); Gray,  
Hand-l. B. i. p. 315, no. 4706.

*Schœnicola platyura*, Blyth, J. A. S. Beng. xiii. p. 374 (1844);  
Jerd. B. Ind. ii. p. 73 (1863); Hume, Str. F. 1878, vol. vii. p. 37;  
id. Str. F. 1879, p. 97; Brooks, Str. F. 1880, p. 209; Hume, t. cit.

p. 211; Legge, B. Ceylon, p. 532, note (1880); Hume, Str. F. 1880, pp. 234, 260; Butler, Cat. B. of South Bombay Pres. p. 43 (1880).

The Indian Broad-tailed Reed-bird inhabits Southern India, and has been procured by Capt. Butler at Belgaum in 16° N. lat.; also by Jerdon in the Goodalore Ghat, Wynaad, 11° 30' N. lat.; again, in Southern Travancore, in 8° 30' N. lat. (*Bourdillon*); and extends into Ceylon (*spec. in Mus. Brit.*), the exact locality being unknown, though Mr. Hume suggests about 7° N. lat.

## 2. SCHÆNICOLA APICALIS.

*Sylvia apicalis*, Licht. MS. in Mus. Berol., undè

*Catriscus apicalis*, Cab. Mus. Hein. Th. i. p. 43 (note); Gurney, Ibis, 1863, p. 323; id. Ibis, 1866, p. 140; Heugl. Ibis, 1869, p. 81; id. Orn. N.O.-Afr. p. 273, tab. ix. (1869); Shelley, Ibis, 1875, p. 71; Sharpe, ed. Layard B. S. Afr. p. 283 (1876).

*Bradypterus brevirostris*, Sundev. K. Vet.-Akad. Förh. Stockh. 1850, p. 483.

*Cettia apicalis*, Licht. Nomencl. Av. Berol. p. 29.

*Sphenæacus alexinæ*, Heugl. J. f. O. 1863, p. 166.

*Drymoica apicalis*, Layard, B. S. Afr. p. 96, no. 173 (1867); Gray, Hand-l. B. i. p. 201, no. 2833 (1869).

*Calamodyta brevirostris*, Gray, Hand-l. B. i. p. 209, no. 2958 (1869).

In North-eastern Africa the African Broad-tailed Reed-bird was met with by Heuglin in the vast grass-lands on the affluents of the Gazelle river. In South Africa it appears to be found only in Natal.

## 3. Description of a new Species of *Anolis* from Yucatan.

By G. A. BOULENGER.

[Received October 28, 1881.]

### ANOLIS BECKERI, sp. n.

Head moderate, much longer than the tibia, its width contained once and three fourths in its length. Snout convex, rounded, as broad as long, with rather indistinct canthus rostralis. No facial rugæ. Prefrontal concavity slightly marked. Nostril lateral, separated from rostral by a granule and a small scale. Front half of snout covered with granular, the remainder with moderate-sized hexagonal smooth scales. Canthal scales four. Superciliary semicircles formed of seven or eight large scales, in contact in the middle, or separated by only one row of narrow scales. Supraorbital disk with moderate-sized smooth scales, separated from superciliaries by two rows of granules. Occipital twice the diameter of ear-opening, surrounded with small irregular scales, and separated from superciliaries by two rows of scales. Three rows of loreal scales. 8-10

supralabials, separated from orbital by a single row of infraorbitals. 10 infralabials. Temporal region covered with minute granules. Gular fan small (♀).

Body scarcely compressed, covered with small smooth granular scales, those on the belly a little larger. Tail cylindric, not much longer than head and body, covered with elongate, slightly keeled scales.

Limbs short, extended forwards, the extremity of longest finger reaches the nostril, and the extremity of longest toe the shoulder. Tibia two thirds the length of the head. Fingers and toes short, with well-developed dilatations.

Light grey above (not bleached), with pure white spots and a dark-brown network; tail encircled by complete dark-brown annuli. Beneath white, with a few dark spots.

	♀ (tail injured).	Half-grown.
Length from tip of snout to extremity of tail..	0·113	0·089
Length of head to ear-opening .....	0·014	0·011
Length of body from ear-opening to vent ....	0·041	0·028
Length of tail .....	0·058	0·050
Length of fore limb.....	0·0195	0·016
Length of hind limb .....	0·029	0·0215

Two specimens of this very distinct species have been recently obtained by the Royal Belgian Museum from M. A. Boucard, together with other Reptiles and Batrachians from Yucatan. Among these were several specimens of the highly interesting *Tripriion petasatus*, Cope (Proc. Acad. N. S. Phil. 1866, p. 127), a Frog which does not appear to have reached European collections before.

This *Anolis* is named in honour of my friend M. Léon Becker, the distinguished Belgian Arachnologist.

4. On the Mollusca procured during the 'Lightning' and 'Porcupine' Expeditions, 1868-70. (Part IV.<sup>1</sup>) By J. GWYN JEFFREYS, LL.D., F.R.S., F.Z.S.

[Received November 4, 1881.]

(Plates LXX., LXXI.)

# CONCHIFERA (concluded).

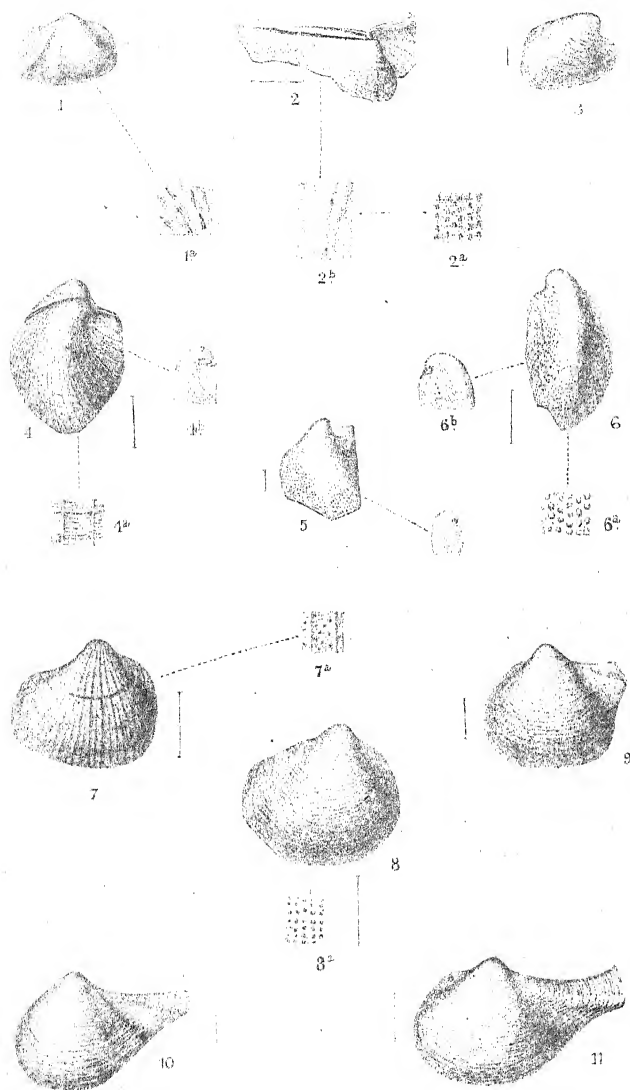
## Family XVI. MACTRIDÆ.

1. *AMPHIDESMA CASTANEUM*, Montagu.

*Donax castanea*, Mont. Test. Brit. App. p. 573, t. 17. f. 2.

*A. castaneum*, B. C. ii. p. 413, pl. viii. f. 1; v. p. 188, pl. xliii. f. 1.

<sup>1</sup> For Part I. see P. Z. S. 1878, p. 393; for Part II. see P. Z. S. 1879, p. 553; for Part III. see P. Z. S. 1881, p. 693.



C. Berggren del. et. sculp.

Harvard. Imp.

MOLLUSCA OF THE LIGHTNING AND  
PORCUPINE EXPEDITIONS.







1



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Yankoot imp.

MOLLUSCA OF THE LIGHTNING AND  
PORCUPINE EXPEDITIONS.



'Porcupine' Exp. 1870: Atl. St. Vigo B., Setubal B., C. Sagres, 26, 30, 36; Med. Algesiras B., 50, Benzert Road, Adventure Bank, off Rinaldo's Chair.

*Distribution.* W. Ireland and S. England to the Archipelago, Madeira, Canaries, and Azores; 12-162 fms.

*Fossil.* Miocene: Vienna Basin, Hungary, S.W. France, Calabria, Madeira. Upper Tertiaries: S. France, Italy, Rhodes. Post-tertiary: Calabria.

*Erycina pusilla* of Philippi.

## 2. AMPHIDESMA CORNEUM, Poli.

*Macra cornea*, Poli, Test. utr. Sic. i. p. 73, t. 19. f. 8-11.

*A. corneum*, B. C. ii. p. 414; v. p. 188.

'Porcupine' Exp. 1870: Atl. St. 26 (valve).

*Distribution.* Carnac in Brittany (*J. G. J.*) to Syria, Adriatic, Black Sea; 0-2 fms.

*Fossil.* Miocene: Vienna and Touraine Basins, Hungary. Upper Tertiaries: S. France, Italy. Post-tertiary: Calabria.

*Donax plebeia*, Pennant, *Amphidesma donacilla*, Lamarck, *Donacilla lamarcki*, Philippi.

## 1. MACTRA SOLIDA, Linné.

*M. solida*, L. S. N. p. 1126: B. C. ii. p. 415, pl. viii. f. 2; v. p. 188, pl. xliii. f. 2, 2a.

'Lightning' Exp. St. 5 (typical); 4, 5, 7, Faroe Isles (var. *elliptica*).

'Porcupine' Exp. 1869: 13, 15, Lough Foyle, 68, The Minch. 1870: Atl. Vigo B., Setubal B., C. Sagres (var. *intermedia*); Med. Capo de Gata (valve, var. *elliptica*).

*Distribution.* Iceland and Finmark to N.W. Spain, Adriatic (on several authorities), Mediterranean?; 0-205 fms. The typical form is littoral, the variety *elliptica* from deeper water.

*Fossil.* Upper Tertiaries and Post-tertiary: Iceland, Norway, British Isles, Belgium?, Germany?, Biot, Italy; 0-130 ft.

*M. vulgaris*, Chemnitz, *M. truncata*, Montagu, *M. castanea* and *M. crassatella*, Lamarck, *M. elliptica*, Brown, and other synonyms for recent and fossil varieties. Not *M. solida* of Payraudeau, which is *M. stultorum*, var. *corallina*.

## 2. MACTRA SUBTRUNCATA, DaCosta.

*Trigonella subtruncata*, DaCosta, Brit. Conch. p. 193.

*M. subtruncata*, B. C. ii. p. 419; v. p. 188, pl. xliii. f. 3.

'Porcupine' Exp. 1869: St. 9, 19 (valve). 1870: Atl. 10, Vigo B., 13, C. Sagres, 30, 36, Tangier B.; Med. Algesiras B., 50, G. Bona, Adventure Bank.

*Distribution.* Finmark to the Morea and Black Sea, Adriatic, Mogador, Madeira?, Canaries?; 0-60 fms.

*Fossil.* Miocene: Vienna and Bordeaux Basins, Switzerland, Germany, Transylvania, Calabria. Pliocene: Coralline and Red

Crag, Belgium, S.W. & S. France, Italy, Greece, Algeria. Post-tertiary: Scandinavia, British Isles, Calabria, Rhodes; 0-50 ft.

*M. triangula* (Renier), Brocchi, and many other synonyms. *M. lateralis* of Say is closely allied, if it be not a variety of the present species.

I subjoin a description of the animal of a small variety from 5 to 7 fathoms in Balta Sound, Shetland:—BODY pale yellowish-white: mantle having its edges fringed with numerous short cirri, which are slightly tubercular at their tips: tubes conical, rather short, covered for the greater part with a leathery sheath, separate at their extremities, minutely speckled with bistre; orifices encircled by two rows of cirri, the outer cirri being longer and thicker than those forming the inner row, which latter are usually bent back on the margin of the sheath; all these cirri are more or less tubercular at the tips; valve of upper tube large and hyaline: foot white, tongue-shaped, long, and finely pointed.

### 3. MACTRA STULTORUM, Linné.

*M. stultorum*, L. S. N. p. 1126; B. C. ii. p. 422; v. p. 188, pl. xliii. f. 4.

'Porcupine' Exp. 1869: St. 2, Lough Swilly, L. Foyle. 1870: Med. Adventure Bank (fragment).

*Distribution*. S. Norway to Egypt and Black Sea, Adriatic, Mogador, Canaries; 0-35 fms. Not Red Sea, as given by Ehrenberg.

*Fossil*. Upper Tertiaries: British Isles, Italy.

### 1. LUTRARIA RUGOSA, Chemnitz.

*Maetra rugosa*, Chemn. Conch.-Cab. vi. p. 236, t. 24. f. 236.

'Porcupine' Exp. 1870: Atl. St. Vigo B. Valves rather abundant on the shore, as well as at Cadiz, whence Chemnitz received it.

*Distribution*. Lusitanian coasts, Gibraltar, various parts of the Mediterranean on the European and African shores, Mogador, Canaries; 0-4 fms. According to Messrs. Adams the only habitat for this shell is the coast of Guinea!

*Fossil*. Miocene: Vienna and Bordeaux Basins, Switzerland. Upper Tertiaries: Bracklesham, Biot, Italy, Greece, Rhodes. Post-tertiary: Selsea.

It is the type of Gray's genus *Eastonia*; but there is no sufficient character to separate it from *Lutraria*.

### 2. LUTRARIA ELLIPTICA, Linné.

*Maetra lutraria*, L. S. N. p. 1126.

*L. elliptica*, B. C. ii. p. 428, pl. viii. f. 3; v. p. 188, pl. xliv. f. 1.

'Porcupine' Exp. 1870: Med. St. 50.

*Distribution*. Norway to Malta and the Morea, Adriatic; 0-22 fms.

*Fossil*. Upper Tertiaries: Coralline and Red Crag, Belgium, S.W. France, Italy, Morea. Post-tertiary: Lancashire, Scotland, Calabria, Rhodes.

Another short account of the animal, from my own observation, may not be useless. It was taken from a specimen which connected the typical form with the variety *alterutra* = *L. gracilis*, Conti. BODY yellowish-white: *mantle* very thick; margin protruded beyond the front edges of the shell: *tubes* united throughout, and encased in a membranous sheath, which extends far beyond the tubes when the latter are not in action; both tubes are mottled with reddish-brown; they are nearly equal in size, and are studded with tubercles (which are occasionally branched) at their orifices: *foot* yellowish-brown, tongue-shaped, very large and fleshy.

Mr. Duprey says he has seen a specimen extend its tubes 5 inches beyond the shell. Both he and Mr. McAndrew have found this species living in company with the next.

### 3. LUTRARIA OBLONGA, Chemnitz.

*Mya oblonga*, Chemn. Conch.-Cab. vi. p. 27, t. 2. f. 12.

*L. oblonga*, B. C. ii. p. 430; v. p. 189, pl. xlv. f. 2.

'Porcupine' Exp. 1870: Med. St. 50.

*Distribution*. S. England and W. Ireland to the Mediterranean and Adriatic, Mogador, Senegal, Cape Verd Is.; 0-20 fms.

*Fossil*. Miocene: Austro-Hungarian Empire, Switzerland, Bordeaux Basin, S. France. Pliocene: Coralline Crag, Italy. Post-tertiary: Belfast, Selsea, Rhodes.

The terminal cirri are cream-colour with a purplish base. It is difficult to distinguish some specimens of this species from *L. elliptica*.

### 1. SCROBICULARIA PIPERATA (Belon), Gmelin.

*Mactra piperata*, L. S. N. ed. Gmel. p. 3261.

*S. piperata*, B. C. ii. p. 444, pl. viii. f. 4; v. p. 189, pl. xlv. f. 5.

'Porcupine' Exp. 1869: St. Galway B.

*Distribution*. Bergen to Sicily, Adriatic, Mogador, Senegal?, Japan; 0-4 fms.

*Fossil*. Upper Tertiaries: Red? and Mammalian Crag, Sicily. Post-tertiary: Scandinavia, British Isles, N.W. Germany; 0-50 ft.

*Chama piperata* of Belon and Aldrovandi, with 15 synonyms. Sold in the markets of Venice and Trieste (Senoner).

### 2. SCROBICULARIA COTTARDI, Payraudeau.

*Lutraria cottardii*, Payr. Cat. Moll. Corse, p. 28, t. 1. f. 1, 2.

'Porcupine' Exp. 1870: Atl. St. Vigo B. (hinge-fragment).

*Distribution*. Gibraltar to the Ægean and Adriatic; 0-20 fms.

*Fossil*. Post-tertiary: Morea.

Syn. *Amphidesma sicula*, G. B. Sowerby, sen.; *S. trigona*, Brusina, is a variety; *Tellina rubiginosa*, Poli, and *Erycina ovata*, Philippi, are the younger state.

### 3. SCROBICULARIA NITIDA, Müller.

*Mya nitida*, Müll. Prodr. Zool. Dan. p. 245.

*S. nitida*, B. C. ii. p. 436; v. p. 189, pl. xlv. f. 2.

'Porcupine' Exp. 1869: St. 1, 2, 10, 17, 18, Donegal B., 61,

Little Minch. 1870 : Atl. 3, Vigo B., 13, 16, 17a, Setubal B., 24, C. Sagres, 26, 29, 30; Med. 45.

*Distribution.* Iceland and Loffoden I. to Sicily and the Adriatic; 3-400 fms.

*Fossil.* Upper Tertiaries : S. Italy. Post-tertiary : Norway; 0-10 ft.

Besides the synonyms given in 'British Conchology,' this species is *Erycina fabula* of Brusina.

Body whitish, with minute flake-white specks : mantle having its edges closely fringed with short but rather stout tentacular processes or cirri, which are studded with tubercular points and are sometimes branched : tubes separate throughout, remarkably long and cylindrical; incurrent or lower tube microscopically veined lengthwise and marked on the inner side with two white lines; its orifice is furnished with slight tooth-like points; orifice of excurrent tube contracted when at rest : foot tongue-shaped, thick and expansile.

#### 4. SCROBICULARIA LONGICALLUS, Scacchi.

*Tellina longicallus*, Sc. Notizie, p. 16, t. 1. f. 7.

'Porcupine' Exp. 1869 : St. 5, 37, 38, 45-45b, Little Minch. 1870 : Atl. 1, 3, 6, 8, 9, Vigo B., C. Sagres, 26-34, 36, Tangier B.; Med. 45, Capo de Gata, 51, 55, Adventure Bank, off Rinaldo's Chair.

*Distribution.* Loffoden I. to the Ægean and Adriatic, off the Canaries ('Challenger' Exp.), E. Mexico (Blake's Exp.); 50-1125 fms.

*Fossil.* Upper Tertiaries : Biot, Italy. Post-tertiary : Norway.

*Syndosmya tellinella*, Seguenza; in the younger state *Ligula profundissima*, Forbes. Philippi misquoted Scacchi's specific name, and called it "*longicallis*" instead of *longicallus*, which is more intelligible if not more classical than the other.

This shell is larger and more compressed and thinner than *S. alba*, is not so oval, and is somewhat flexuous at the posterior side; the cartilage and its pit are elongated and much narrower. In *S. alba* the pit is spoon-shaped. The lateral teeth are far longer in the present species. Excellent figures of *S. longicallus* are given in Professor G. O. Sars's work on the arctic Mollusca of Norway. It is also a British species, and was regarded by me as a large form or variety of *S. alba*. The range of depth at which *S. longicallus* has been found living is very remarkable, extending according to the 'Porcupine' Expedition from 20 to 2435 fms.

#### 5. SCROBICULARIA ALBA, W. Wood.

*Mastra alba*, W. Wood, in Linn. Trans. vi. p. 165, t. xvi. f. 9-12.

*S. alba*, B. C. ii. p. 438, pl. viii. f. 4; v. p. 189, pl. xlv. f. 3.

'Porcupine' Exp. 1869 : St. 3, North Channel, 40 (var. *radiata*), near Belfast. 1870 : Atl. Vigo B., C. Sagres; Med. Cartagena B., 50, G. Bona.

*Distribution.* Finmark to Sea of Marmora, Adriatic, Mogador; 2-400 fms. Bay of Biscay ('Travailleur' Exp.); 504-645 fms.

*Fossil.* Miocene: Vienna Basin. Upper Tertiaries: English and Belgian Crags, S. France, Italy. Post-tertiary: Scandinavia, British Isles, Calabria, Rhodes; 0-460 ft.

There are many synonyms, including *Tellina apelina* of Renier, *Mactra boysii* of Montagu, and *Erycina renieri* and *E. similis* of Philippi. Renier never described this species. He seems to have taken the name *apelina* from Gmelin, who altered it from *opalina* of Chemnitz, a very different shell said to inhabit the Nicobar Isles.

#### 6. SCROBICULARIA PRISMATICA, Montagu.

*Ligula prismatica*, Mont. Test. Brit. Suppl. p. 23, t. 26. f. 3.

*S. prismatica*, B. C. ii. p. 435; v. p. 189, pl. xlv. f. 1.

'Porcupine' Exp. 1869: St. 6, 14, 23a, 25, North Channel, 33, 35, 40, 51, 68. 1870: Atl. 10, 16; Med. 50, G. Bona, Benzert Road, G. Tunis, Adventure Bank.

*Distribution.* Iceland and Hammerfest to the Ægean and Adriatic; 0-150 fms.

*Fossil.* Upper Tertiaries: Coralline and Red Crag, Belgium, Biot, Italy. Post-tertiary: Norway, Scotland, Calabria.

*Tellina angulosa* of Renier, but not described, nor Gmelin's species of that name; *T. stricta*, Brocchi, *Ligula donaciformis*, Nyst, and *Erycina vitrea*, Danilo and Sandri.

### Family XVII. SOLENIDÆ.

#### 1. SOLECURTUS SCOPULA, Turton.

*Psammobia scopula*, Turt. Conch. Brit. p. 98, pl. vi. f. 11, 12. (1822).

*S. candidus*, B. C. iii. p. 3; v. p. 190, pl. xlv. f. 1.

'Porcupine' Exp. 1870: Med. St. 50.

*Distribution.* Shetland Is. to the Morea, Adriatic, Madeira, Canaries; 0-80 fms. It has not been noticed in that part of the Norwegian seas which is in the same latitude as Shetland.

*Fossil.* Upper Tertiaries: Belgium, Italy. Post-tertiary: Scotland, Rhodes.

I give a fuller description of the animal:—Body dirty white, with a faint tinge of brown: *mantle* thick, protruded beyond the valves of the shell; edges finely and minutely ciliated: *tubes* united in a fleshy sheath to within a short distance from their extremities, where they diverge and become strangled or corrugated; both tubes are finely ciliated in longitudinal rows; orifices fringed with short papillæ; the incurrent or larger tube is sometimes speckled with orange towards the point; the excurrent tube is somewhat narrower, but often longer than the other; the tubes vary in their relative length: *foot* tongue-shaped, very thick and fleshy. Inhabits the sand at low-water mark, Herm.

I must repeat my doubt that the *Solen candidus* of Renier was this species, or any thing more than a white variety of *Solecurtus strigilatus*. Renier's specific name has not been adopted by later writers on Mediterranean conchology. Scacchi in 1836 described

and figured the present species as *Solen multistriatus*; but that was fourteen years after Turton. The late Dr. Nardo referred Renier's shell to *Solecuretus candidus* of de Blainville; the specific name given by the latter, however, was *albus* (Dict. Sc. Nat. xlix. p. 420); and the date of his publication is 1827, five years after that of Turton.

## 2. SOLECURTUS ANTIQUATUS, Pulteney.

*Solen antiquatus*, Pult. Cat. Dors. p. 28, pl. iv. p. 5.

*Solecuretus antiquatus*, B. C. iii. p. 6, pl. i. f. i.; v. p. 190, pl. xvi. f. 2.

'Porcupine' Exp. 1870: Atl. St. 10. 13, Setubal B., C. Sagres, 36, Tangier B.; Med. Capo de Gata, Cartagena B., 50, 50 a, Benzert Road, G. Tunis, Adventure Bank.

*Distribution.* Bohuslän (S. Sweden) to the Morea, Adriatic, Madeira, Canaries; 4-50 fms.

*Fossil.* Miocene: Vienna Basin and throughout a considerable part of the European continent. Upper Tertiaries: Coralline Crag, Belgium, Biot, Italy, Morea. Post-tertiary: Belfast, Calabria, Rhodes, Cyprus.

Not *Solen coarctatus* of Gmelin. The habitat given by Chemnitz (from whose figure Gmelin named it) was the Nicobar Isles, and the size  $2\frac{1}{4}$  inches.

## CERATISOLEN LEGUMEN, Linné.

*Solen legumen*, L. S. N. p. 1114.

*C. legumen*, B. C. iii. p. 10, pl. i. f. 2; v. p. 190, pl. xvi. f. 3.

'Porcupine' Exp. 1870: Med. St. 50.

*Distribution.* Scandinavia (Müller), S. & W. England and Ireland to Egypt, Adriatic, Mogador, Senegal?, Guinea?, Port Said?; 0-20 fms.

*Fossil.* Miocene: Vienna and Bordeaux Basins, Switzerland. Upper Tertiaries: Italy. Post-tertiary: Belfast, W. Scotland, Rhodes.

## 1. SOLEN PELLUCIDUS, Pennant.

*S. pellucidus*, Penn. Br. Zool. iv. p. 84, pl. lxvi. f. 23: B. C. iii. p. 14; v. p. 190, pl. xvi. f. 4.

'Porcupine' Exp. 1869: St. 2, 9, 18, 33, 68, Little Minch, near Belfast. 1870: Atl. Tangier B.; Med. 51, G. Bona (var. minor, rector = *S. tenuis*).

*Distribution.* Loffoden Is. to the Ægean and Adriatic; 0-85 fms.

*Fossil.* Upper Tertiaries: Coralline and Red Crag, Belgium, Italy. Post-tertiary: Aldeby, Belfast.

*S. pygmaeus*, Lamarek: Var. *S. tenuis*, Philippi: *Cultellus suttonensis*, Searles Wood; not his *C. tenuis* (afterwards *C. cultellatus*). Not *S. pellucidus*, Spengler, from Chemnitz.

## 2. SOLEN ENSIS, L.

*S. ensis*, L. S. N. p. 1114: B. C. iii. p. 16; v. p. 190, pl. xvii. f. 1.

'Porcupine' Exp. 1870: Med. St. 50, 50 a.



*Distribution.* Finmark and Faroe Is. to Sicily, Adriatic, Black Sea; 0-23 fms. Philippi, in his letter to Scacchi, dated 2nd Nov. 1844, stated that this species, as well as *S. siliqua*, from the German Ocean and North Atlantic, were probably different from those of the Mediterranean; but he gave no reason for his opinion.

*Fossil.* Miocene: Madeira. Upper Tertiaries: Iceland, Coralline and Red Crag, Belgium, Italy. Post-tertiary: Norway, British Isles, Calabria; 0-80 fms. Not *S. ensis* of Philippi, from the Tertiaries of N.W. Germany, which is the *S. rollei* of Hörnes.

Mr. David Robertson tells me that, during a very low spring-tide at Cumbræ, he found three living specimens fixed upright in the sand, with about an inch and a half of the shells exposed, to which portion in each of the specimens two or three common mussels were attached, so as to completely prevent the Solens getting further down or burrowing. They appeared to be healthy.

### 3. SOLEN VAGINA, Linné.

*S. vagina*, L. S. N. p. 1113: B. C. iii. p. 20; v. p. 190, pl. xlvii. f. 3.

'Porcupine' Exp. 1870: Atl. C. Sagres, 26 (fragments).

*Distribution.* Norway to Egypt, Black Sea, Adriatic, Red Sea?, Azores; 0-10 fms.

*Fossil.* Miocene: Vienna and Bordeaux Basins, Switzerland, Poland, Calabria. Upper Tertiaries: S. France, Italy, Algeria. Post-tertiary: Belfast, Sicily, Morea.

*S. marginatus*, Pulteney. The habitat given by Linné is "M. Europeo, Indico." The Indian species has been named *S. truncata* by W. Wood.

## Family XVIII. PANDORIDÆ.

### PANDORA INÆQUIVALVIS, Linné.

*Tellina inæquivalvis*, L. S. N. p. 1118.

*Pandora inæquivalvis*, B. C. iii. p. 24, pl. i. f. 4; v. p. 190, pl. xlviii. f. 1, 1a.

'Porcupine' Exp. 1869: St. 1, 6, 10, 13, 14, 23a, 25, 45a, 45b, Little Minch (all var. *pinna*). 1870: Atl. 16, Vigo B., 13, Setubal B., C. Sagres, Tangier B.; Med. Algesiras B., Cartagena B., G. Bona, G. Tunis, Adventure Bank (all vars. *pinna* and *intermedia*).

*Distribution.* Spitzbergen and Arctic Ocean, Siberian coasts, and N.E. America (as *P. glacialis*) to the Ægean, Adriatic, Mogador, Madeira, and Canaries (as *P. inæquivalvis* and *P. pinna* or *obtusa*); type, laminarian zone; vars. *glacialis* and *pinna* or *obtusa*, coralline zone to 130 fms. An intermediate form occurs on the western coast of France and at Corunna. Although this species is not uncommon off the coasts of Shetland, it has not been noticed by modern writers in any part of the Scandinavian seas. Chemnitz said that, according to Grönovius, it inhabits the coast of Norway.

*Fossil.* Miocene: Vienna Basin and Switzerland. Pliocene: Co-  
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ralline and Red Crag, S. France and Italy. Post-tertiary: Hopton in Suffolk and Calabria.

1. *LYONSIA NORVEGICA*, Chemnitz.

*Mya norvegica*, Chemn. Conch.-Cab. x. p. 345, t. 170. f. 1647, 1648.

*L. norvegica*, B. C. iii. p. 29, pl. ii. f. 1; v. p. 190, pl. xlviii. f. 2.

'Porcupine' Exp. 1869: St. 1, 10, 14, 18, 23a, 35, 68. 1870: Med. G. Bona, Benzert Road, Rasel Amoush.

*Distribution*. Loffoden I. to the Ægean and Adriatic, and (according to Dr. Philip Carpenter), Seniavine Straits in the North Pacific; 2-162 fms.

*Fossil*. Pliocene: Sicily.

Not *L. norvegica* of Middendorff, which is *L. arenosa*, but probably *Mya membranacea* of Gmelin from Müller's 'Prodromus,' and *Osteodesma inflatum* of Danilo and Sandri. For other synonyms see 'British Conchology,' iii. pp. 31, 32.

2. *LYONSIA FORMOSA*<sup>1</sup>, Jeffreys. (Plate LXX. fig. 1.)

SHELL oval, equivalve, pearly, thin, and semitransparent: *sculpture*, numerous and close-set rows of minute tubercles, arranged lengthwise; the posterior side is also marked with from six to eight diagonal flexuous ribs or folds, of which the innermost is the strongest and forms a keel; there are, besides, traces of other flexuous ribs in the middle and on the anterior side; the posterior side has likewise a few rows of short but irregular prickles as well as the tubercles: *colour* silvery-white: *epidermis* filmy and only perceptible on the edges of the shell: *margins* rounded on the anterior side, gently curved in front, with a slight sinuosity and contraction towards the posterior side, which is somewhat truncated; dorsal margin incurved on each side of the umbo: *beaks* triangular, inclined to the anterior side: *ossicle* pearly, heart-shaped or notched at the posterior end: *cartilage* brownish-yellow, enclosing the ossicle; pit oval, with thickened edges: *hinge-plate* long and thick: *inside* highly polished and iridescent: *muscular scars* broad and distinct. L. 0.4, B. 0.65.

'Porcupine' Exp. 1869: St. 23. 1870: Atl. 3a; Med. 55.

*Distribution*. 'Challenger' Exp. off Gomera, Canaries, 620 fms.; off Carysfort in the Gulf of Mexico (*Pourtales*), 349 fms.; Bay of Biscay ('Travailleur' Exp.), 552-600 fms.

A most lovely shell, and one of the prizes of the deep-sea dredger, who might be classed in the former part of Wordsworth's category as

"They who rather dive than soar."

3. *LYONSIA ARGENTEA*<sup>2</sup>, Jeffreys. (Plate LXX. fig. 2.)

SHELL triangularly oval, rather solid, opaque, and of a dull hue: *sculpture*, a few slight ribs longitudinally radiating from the beak in the right valve, none in the other valve, which, however, is strength-

<sup>1</sup> Beautiful.

<sup>2</sup> Silvery.

ened by a rib on the upper part of the posterior side; the whole surface is covered with minute prickly tubercles arranged lengthwise in numerous rows: *colour* yellowish-white: *epidermis* inconspicuous: *margins* in front slightly curved, fibrous at the edges: *beaks* triangular, somewhat incurved; umbones prominent: *hinge-plate* thick: *inside* of a silvery lustre. L. (about) 0·5, B. (about) 0·8.

'Porcupine' Exp. 1869: St. 23a. 1870: Atl. 27-29. Fragments only.

*Distribution.* Palermo (*Monterosato*); 65 fms. (120 m.).

# 1. PECCHIOLIA ABYSSICOLA, M. Sars.

*Lyonsiella abyssicola*, M. Sars, Vid.-Selsk. Förh. 1868, p. 257.

*P. abyssicola*, G. O. Sars, 'On some remarkable Forms of Animal Life from the great deeps of the Norwegian coast,' i. p. 25, pl. iii. f. 21-43; Moll. Reg. arct. Norv. p. 82, t. 20. f. 5, a-d.

'Porcupine' Exp. 1869: St. 1, 6, 23a, 39. 1870: Atl. 16, 17, 17a.

*Distribution.* Spitzbergen to the Skagerack, 'Valorous' Exp., Davis Strait, New England; 50-1450 fms.

Body yellowish, streaked with pink at the sides: *mantle* thick: *tubes* sessile; the larger tube is wide and exposes the gills, and it is fringed with a few short orange-colour tentacular cirri; the smaller or excretal tube (which is situate at the broader end of the shell) is circular: *foot* conical and white, protruded at the narrower end of the shell.

I feel myself compelled by the laws of scientific nomenclature to use the generic term *Pecchiolia* instead of *Verticordia*. The latter name was proposed in 1844 by Mr. Searles Wood for a Crag shell which was figured by Mr. James Sowerby in his 'Mineral Conchology' (plate 639); but, in consequence of the publication of the second volume of Philippi's work on the Mollusca of the two Sicilies in the same year (1844), Mr. Wood and Mr. Sowerby gave up *Verticordia* and adopted *Hippagus*, under the supposition, which they shared with Philippi, that their fossil shell belonged to Lea's genus *Hippagus*. However, I have elsewhere shown, and it is quite clear, that the last-named genus is the same as *Crenella*, and referable to another division of the Conchifera. Whether the author of the name *Verticordia* had a right to repudiate it and erroneously substitute another for it may be questionable. *Verticordia* had been long previously established by de Candolle for a genus of Myrtaceæ, and is now commonly used by botanists. *Pecchiolia* was proposed in 1851 by Meneghini for a well-known Miocene shell, the *Chama argentea* of Mariti, 1797 = *C. arietina*, Brocchi, 1814. In *Pecchiolia* the beak is incurved as in *Isocardia*, leaving a more or less deep lunule, which is impressed on the hinge, and gives the appearance of a tooth-like projection in some species. But I am by no means satisfied that *Pecchiolia* is distinguishable from *Lyonsia* by any sufficient character.

2. *PECCHIOLIA SUBQUADRATA*<sup>1</sup>, Jeffreys. (Plate LXX. fig. 3.)

SHELL forming a short oblong, or squarish, very convex, thin, semitransparent, and glossy; *sculpture*, numerous but irregular microscopic tubercles, which penetrate the outer layer of the shell; these are larger in front and on each side: *colour* pale yellowish-white: *margins* short and rounded on the anterior side, broad and gently curved in front, rounded but somewhat truncated on the posterior side, nearly straight at the back: *beaks* small, blunt, and slightly incurved; umbones prominent: *lunule* short and deep: *hinge-line* obtuse-angled: *hinge-plate* rather thick, considering the texture of the shell: *cartilage* long, pale yellowish: *teeth* none: *inside* polished: *scars* inconspicuous. L. 0·1, B. 0·15.

'Porcupine' Exp. 1869: St. 47. 1870: Atl. 16, 17.

Differs from the young of *P. abyssicola* in shape and sculpture.

3. *PECCHIOLIA INSCULPTA*<sup>2</sup>, Jeffreys. (Plate LXX. fig. 4.)

SHELL globular, with a square outline, equivalve, very thin, pearly, semitransparent, and glossy: *sculpture*, about 25 delicate riblets or striæ, which radiate from the beak in each valve, besides microscopic and numerous concentric striæ in the interstices of the riblets, and irregular lines of growth; the anterior end is smooth: *colour* white: *epidermis* membranous, sometimes partially incrustated with mud: *margins* bluntly angular on the anterior side, nearly straight in front, obliquely sloping or truncated on the posterior side, nearly straight at the back: *beaks* sunken, small, incurved; umbones prominent: *lunule* heart-shaped: *ossicle* white, solid, obliquely twisted, unequally forked on the broader end towards the posterior side: *hinge-plate* short, thickened: *inside* glossy: *scars* slight. L. 0·25, B. 0·25.

'Porcupine' Exp. 1869: St. 1, 10, 22. 1870: Med. Off. Jijeli (a larger valve).

*Distribution*. Bay of Biscay ('Travailleur' Exp.); 552-645 fms. Palermo (*Monterosato*); 162 fms.

*Fossil*. Pliocene: Messina (*Seguenza*, as *Verticordia ecostata*, and afterwards *V. insculpta*).

4. *PECCHIOLIA SINUOSA*<sup>3</sup>, Jeffreys. (Plate LXX. fig. 5.)

SHELL of an irregular shape, but somewhat triangular and sinuous, convex, thin, opaque and lustreless: *sculpture*, close-set microscopic tubercles arranged in longitudinal rows; they are easily rubbed off, and then the surface becomes quite smooth and glossy: *colour* white: *epidermis* filmy: *margins* imperfect, but rounded on the anterior side, apparently sloping obliquely in front, nearly straight at the back: *beaks* very small, incurved: *lunule* excavated, enclosed by a slight ridge: *hinge-plate* narrow, twisted, and presenting the appearance of having a short notch or fold under the beak: *inside* nacreous: *scars* indistinct. L. 0·3, B. 0·35.

'Porcupine' Exp. 1870: Atl. St. 16 (fragments only).

<sup>1</sup> Squarish.

<sup>2</sup> Engraved.

<sup>3</sup> Full of folds, sinuous.

Allied to *Verticordia axinoides* of Seguenza, a Sicilian Pliocene fossil, but very much smaller and not so deeply sinuated on the posterior side.

5. *PECCHIOLIA ANGULATA*<sup>1</sup>, Jeffreys. (Plate LXX. fig. 6.)

SHELL lengthwise oblong or shaped like a *Mytilus*, angular and crooked, gibbous in the middle, rather solid, opaque, and lustreless: *sculpture*, numerous minute tubercles or short prickles arranged lengthwise in rows: *colour* yellowish-white: *epidermis* apparently wanting; *margins* rounded on the anterior side, sloping in front, nearly straight on the posterior side, triangular at the back; *beak*: blunt, twisted inwards: *lunule* small: *cartilage-pit* narrow: *hinge-plate* rather broad, folded outwards: *inside* nacreous: *scars* inconspicuous. L. 0.35, B. 0.2.

'Porcupine' Exp. 1870: Atl. St. 24 (a single and imperfect valve).

*Distribution*. Off the Josephine Bank ('Josephine' Exp.); 340-430 fms. A small single valve.

6. *PECCHIOLIA GRANULATA*, Seguenza.

*Verticordia granulata*, Seg. in Journ. Conch. viii. (1860), p. 293, pl. x. f. 2, f-h.

*V. trapezoidea*, Seg. Acc. Sc. fis. e mat. 1876, p. 7.

'Porcupine' Exp. 1870: Atl. St. 2, 3, 6, 8, 9, 27-29; Med. 55, Adventure Bank, off Rinaldo's Chair.

*Distribution*. Off Tripoli coast in 'Shearwater' Exp., Palermo, Hydra Channel G. Egina, G. Mexico off Boca Grande, Gotto Is., Japan; 66-162 fms.

*Fossil*. Miocene: Calabria, Madeira. Pliocene: Calabria, Sicily.

*Verticordia multicostata*, A. Adams, 1862. I regard *V. trapezoidea* of Seguenza as the young of the present species. Both occurred in the 'Porcupine' Expedition. The size of my largest specimen is  $3\frac{1}{2}$  tenths long and the same in breadth. The right valve has a tooth-like callosity under the lunule, and a laminar lateral tooth on the posterior side.

7. *PECCHIOLIA ACUTICOSTATA*, Philippi.

*Hippagus acuticostatus*, Phil. Moll. Sic. ii. p. 42, t. xiv. f. 19, a, b, c.

'Porcupine' Exp. 1870: Atl. St. 24-28a; Med. 55 (fragment).

*Distribution*. G. Mexico off Rebecca I., off Barbadoes ('Blake' Exp.), Azores ('Josephine' Exp.), Japan; 71-600 fms.

*Fossil*. Pliocene: Coralline Crag, Calabria and Sicily.

*Hippagus verticordius*, S. V. Wood, MS.; *H. cardiiformis*, J. Sowerby; *Verticordia deshayesiana*, Fischer; *V. japonica*, A. Adams. My largest specimen is  $5\frac{1}{2}$  by  $4\frac{1}{2}$  tenths. The tooth-like protuberance is very prominent. Coralline Crag specimens are smaller and flatter; the tubercles (or "*spinulae*," as Mr. Wood called them) are

<sup>1</sup> Angular.

distinctly observable in these as well as in recent specimens. Mr. Dall says that the number of ribs varies from 14 to 17.

PHOLADOMYA LOVENI<sup>1</sup>, Jeffreys. (Plate LXX. fig. 7.)

SHELL inequilateral, wedge-shaped, gaping at the posterior end, convex, of a pearly nature, thin, partly semitransparent, lustreless: *sculpture*, 10–12 longitudinal ribs, besides some intermediate striæ; these are more or less interrupted by strong periodical marks of growth, so as to give the ribs a nodulous appearance; the sides are ribless; the whole surface is covered with minute prickly tubercles: *colour* white: *margins* rounded on the anterior side, inclining upwards towards the other side, which is also rounded but slightly truncate, sloping at the back from each side of the umbo: *beaks* bluntly triangular, turned inwards; umbones prominent: *ligamental pit* in the right valve obtuse-angled, placed outside underneath the beak, and defined outwards by a thin plate: *hinge-line* sloping towards the posterior side: *hinge-plate* thin, sinuous, reflected: *teeth* none: *inside* highly glossy and nacreous: *scars* inconspicuous. L. 0.4, B. 0.5.

‘Porcupine’ Exp. 1870: Atl. St. 22, 28a; Med. 55. None of the specimens are quite perfect. One of them indicates twice the size given in the description. That figured is from the ‘Josephine’ Expedition.

*Distribution.* Palermo, fragments (*Monterosato*); 162 fms.: off Marseilles (‘Travailleur’ Exp. 1881); Villa franca, Azores (‘Josephine’ Exp.); 320–600 fms.

Monterosato doubtfully refers this species to the *Thracia pholadomyoides* of Forbes from the Ægean; but Forbes knew too well the hinge-structure of *Thracia* as well as of *Pholadomya* to have made such a mistake in the genus. His description is as follows (1844):—

“Fam. Pyloridæ. Genus *Thracia*, Leach.

“*Thracia pholadomyoides*, sp. nov.

“*T. testâ ventricosâ, sinuosâ, granulatâ, concentricè sulcatâ, sulcis longitudinalibus paucis* (6) *decussatâ; umbonibus acutis.*  
Long.  $0\frac{9}{12}$ , lat.  $1\frac{9}{12}$  unc. Cape Artemisium (1808).”

I cannot guess the meaning of the last figures. Forbes gives also two other species of *Thracia*, viz. *phaseolina* and *pubescens*. I should have been inclined to consider his *T. pholadomyoides* a young *T. corbuloidea* but for that part of his description which mentions the decussation of concentric furrows by six longitudinal furrows. *P. zanclea* of Seguenza, from the Sicilian pliocene formation, is allied to the present species; but it is more rounded, and is not produced or extended at the anterior side. If our species be that of Forbes, the name *pholadomyoides* would be inappropriate.

<sup>1</sup> Named in honour of Professor Lovén, the eminent Swedish zoologist.

## Family XIX. ANATINIDÆ.

## 1. THRACIA PRÆTENUIS, Pulteney.

*Mya prætenuis*, Pult. Cat. Dors. p. 28, pl. iv. f. 7.

*T. prætenuis*, B. C. iii. p. 34; v. p. 190, pl. xlviii. f. 3.

'Porcupine' Exp. 1869: St. 10 (young), Galway B., 17 (young).

*Distribution*. Iceland and Loffoden Is. to Algiers and Sicily; 0-50 fms.

*Fossil*. Pliocene: Coralline Crag, Italy, Rhodes. Post-tertiary: Norway, England, Calabria; 0-130 ft.

## 2. THRACIA PAPYRACEA, Poli.

*Tellina papyracea*, Poli, Test. Sic. i. p. 43, t. xv. f. 14, 18.

*Thracia papyracea*, B. C. iii. p. 36, pl. ii. f. 2; v. p. 191, pl. xlviii. f. 4, 4a.

'Porcupine' Exp. 1869: St. 10, 25, 33, 36 (fragment), 68. 1870: Atl. 10, Vigo B., 26-28a; Med. Cartagena B., 55 (fragment).

*Distribution*. Iceland and Loffoden Is. to the Ægean, Adriatic, Morocco, Madeira, Canaries, ? G. Mexico ('Blake' Exp.); 0-640? fms.

*Fossil*. Miocene: Vienna Basin. Pliocene: Coralline Crag, Italy. Post-tertiary: Norway, Sweden, Great Britain and Ireland, Calabria; 0-130 ft.

## 3. THRACIA PUBESCENS, Pulteney.

*Mya pubescens*, Pult. Cat. Dors. p. 27, pl. iv. f. 6.

*T. pubescens*, B. C. iii. p. 38; v. p. 191, pl. xlviii. f. 5.

'Porcupine' Exp. 1870: Atl. St. Setubal B., C. Sagres (fragmentary), 36 (valve); Med. Capo de Gata (fragment).

*Distribution*. S. England to G. Egina, Adriatic, Morocco, Canaries; 1-130 fms.

*Fossil*. Pliocene: Coralline Crag, Italy. Post-tertiary: Yorkshire, Scotland, and Ireland, Calabria.

## 4. THRACIA CONVEXA, W. Wood.

*Mya convexa*, W. Wood, Gen. Conch. i. p. 92, pl. 18. f. 1.

*T. convexa*, B. C. iii. p. 39; v. p. 191, pl. xlviii. f. 6.

'Porcupine' Exp. 1869: St. Loch Torridon. 1870: Atl. 10, 16, C. Sagres, 27-28a; Med. off Rasel Amoush. All the specimens are fragmentary.

*Distribution*. Bergen to Sicily and the Adriatic, Sitka (*Dall*, as *T. curta* of Conrad); 4-628 fms.

*Fossil*. Miocene: Vienna Basin and Switzerland. Pliocene: Coralline Crag, Italy. Post-tertiary: Norway, Scotland and Ireland, Calabria; 0-500 ft.

Besides the synonyms given in 'British Conchology,' I may mention *T. trigona* of Aradas and *T. hiatelloides* of Brusina.

## 5. THRACIA CORBULOÏDEA, de Blainville.

*T. corbuloidea*, de Blainv. Dict. Sc. Nat. xvi. p. 514; Atlas, pl. 76. f. 7.

'Porcupine' Exp. 1870: Med. St. Cartagena B. (fragment).

*Distribution.* S.W. France, Mediterranean and Adriatic.

*Fossil.* Pliocene: Red? and Coralline Crag, Italy. Post-tertiary: Calabria.

*Syn.* *T. inflata*, J. Sowerby, *T. subtilissima* of Renier according to Nardo, *T. maravignæ*, Aradas and Calcara according to Aradas and Tiberi. The young is *T. meneghiniana* of Aradas. The specific name is erroneously spelt *corbuloides* by modern authors.

## Family XX. CORBULIDÆ.

## 1. POROMYA GRANULATA, Nyst &amp; Westendorff.

*Corbula granulata*, Nyst & West. Coq. Foss. d'Anvers, p. 6, pl. iii. f. 3.

*P. granulata*, B. C. iii. p. 45, pl. ii. f. 3; v. p. 191, pl. xlix. f. 1.

'Lightning' Exp. St. 2.

'Porcupine' Exp. 1869: St. 1, 23a. 1870: Atl. 10, 24, C. Sa-gres, 24, 26-30, 36; Med. Cartagena B., 50, Benzert Road, Adventure Bank, off Rinaldo's Chair.

*Distribution.* Loffoden Is. to the Ægean and Adriatic, Madeira, G. Mexico, off Barbadoes and Sombreros ('Blake' Exp.), New England and Maine; 15-300 fms.

*Fossil.* Pliocene: Coralline Crag, Antwerp Crag, S. France, Calabria and Sicily. Not *P. granulata* of Philippi from the Miocene formation of N.W. Germany.

## 2. POROMYA NEEROÏDES, Seguenza. (Plate LXX. fig. 8.)

*P. neeroides*, Seg. Boll. d. R. Com. geol. 1877, p. 270.

'Porcupine' Exp. 1870: Atl. St. 23a, 24, 28a. Valves.

*Distribution.* G. Mexico; 114 fms.

*Fossil.* Pliocene: Calabria and Sicily.

*P. tuberosa*, Jeffreys MS. The present species differs from *P. granulata* in having greater breadth in proportion to the length, in not being strongly angulated on the posterior side, and especially in the sculpture, which consists of close-set longitudinal lines of minute prickly tubercles instead of irregularly disposed granules.

## A. Smooth. Typical.

1. NEERA TRUNCATA<sup>1</sup>, Jeffreys. (Plate LXX. fig. 9.)

SHELL squarish, very convex, moderately solid, opaque, glossy: *sculpture*, smooth, with the exception of irregular but rather numerous lines of growth; rostrum short but broad, separated or defined by a gradual indentation; it has two slight ridges or keels extending outwards from the beak at an acute angle: *colour* whitish: *margins*

Lopped off,



rounded on each side, gently curved in front, straight at the back : *beak* small and pointed, recurved towards the anterior side ; umbones very prominent ; *cartilage-pit* oval, minute, placed obliquely under the beak : *hinge-line* straight : *hinge-plate* narrow : *teeth* consisting of only a slight lateral on the posterior side : *inside* glossy : *scars* indistinct. L. 0·25, B. 0·3.

'Porcupine' Exp. 1870 : Atl. St. 16 (a single valve and a fragment).

*Distribution.* Bay of Biscay ('Travailleur' Exp.), a living and perfect specimen ; 733 fms.

## 2. *NEERA SUBTORTA*, G. O. Sars.

*N. subtorta*, G. O. Sars, Moll. reg. arct. Norv. p. 87, t. 6. f. 6, *a-c*.

'Lightning' Exp. St. 1, 3.

'Porcupine' Exp. 1869 : St. 62.

*Distribution.* Spitzbergen, Norwegian arctic Expedition, Finmark, Kara Sea ; 30-123 fms.

*Fossil.* British North-Polar Expedition, lat. 82° 33' ; 40 ft.

## 3. *NEERA SULCIFERA*<sup>1</sup>, Jeffreys. (Plate LXX. fig. 10.)

*SHELL* obliquely oval, convex, thin, semitransparent, rather glossy : *sculpture*, irregular lines of growth, which become curved striæ on the upper part of the anterior side ; rostrum short and broadish, separated from the rest of the shell by a furrow, as if pinched up : it has a single ridge or keel in the middle, extending from the beak to the posterior end : *colour* white : *epidermis* fibrous : *margins* rounded on the anterior side and in front, terminating on the posterior or rostral end in a blunt curve, and sloping at the back on each side of the umbo : *beaks* blunt, slightly incurved ; umbones prominent : *cartilage-pit* forming a small narrow and oblique slit : *teeth* as in *N. truncata* : *inside* glossy, exhibiting there the underside of the furrow as a ridge : *scars* indistinct. L. 0·25, B. 0·35.

'Porcupine' Exp. 1869 : St. 40. 1870 : Atl. 9, 13, C. Sagres, 27, 28.

*Distribution.* Bay of Biscay ('Travailleur' Exp.) ; 552-628 fms.

This species differs from *N. subtorta* in being somewhat broader and not twisted, and in having a blunter rostrum, which is marked by a ridge in the middle and separated by a furrow from the rest of the shell. The last characters serve to separate it also from *N. obesa*.

## 4. *NEERA OBESA*, Lovén.

*N. obesa*, Lov. Ind. Moll. Scand. p. 48 ; G. O. Sars, Moll. reg. arct. Norv. p. 86, t. 6. f. 4, *a-c*.

'Porcupine' Exp. 1869 : St. 37 (young, living). 1870 : Atl. 1, 3.

*Distribution.* Spitzbergen, Norway, Skager Rack and Cattegat, Azores, N.E. America, Catania ? ; 20-1000 fms.

*Fossil.* Pliocene : Calabria ?

<sup>1</sup> Marked with a furrow.

*Syn. N. pellucida* of Stimpson, *N. ardiniana* of Biondi?, according to Monterosato; var. *N. glacialis* of G. O. Sars. Not *N. obesa* of S. V. Wood.

5. *NEERA CUSPIDATA*, Olivi.

*Tellina cuspidata*, Olivi, Zool. Adr. p. 101, t. iv. f. 3.

*N. cuspidata*, B. C. iii. p. 53, pl. ii. f. 4; v. p. 191, pl. xlix. f. 5. 'Porcupine' Exp. 1869: St. 1, 6, 9, 13, 23a, 25 (var. *curta*), 55, 61, 68, 69, Little Minch, off Lerwick. 1870: Atl. 10 (var. *curta*), 13 (var. *curta*), C. Sagres, 36 (and var. *curta*); Med. Capo de Gata, 55 (fragment), G. Bona, Benzert Road, Rasel Amoush, Adventure Bank, off Rinaldo's Chair (and var. *acutalis*, smaller, running to a point).

*Distribution.* S. Greenland, Spitzbergen, and Finmark to the Ægean and Adriatic, Madeira, Canaries, China Sea?; 12-733 fms.

*Fossil.* Miocene: Vienna Basin, Baden, S. France. Pliocene: Coralline Crag?, Belgium, Italy. Post-tertiary: Norway, Calabria; 0-50 ft.

6. *NEERA GRACILIS*<sup>1</sup>, Jeffreys. (Plate LXX. fig. 11.)

SHELL forming a rather long oval, convex, not very thin, opaque, lustreless: *sculpture*, slight and irregular but numerous striae in the line of growth, which become wrinkled towards the rostrum: *colour* whitish: *epidermis* slight, caducous: *margins* rounded on the anterior side, gently curved in front; posterior side or rostrum broad, abruptly terminating, somewhat keeled or angular, and having the striae in this part arranged lengthwise or at a right angle to the concentric striae; dorsal margin incurved; *beaks* mamillar, slightly inflected towards the anterior side; umbones small, but prominent, and projecting behind: *cartilage-pit* small, oblique, and sunken: *hinge-line* raised on the anterior and incurved on the posterior side: *hinge-plate* folded back on the anterior and thickened on the other side: *teeth*, a triangular and nearly upright lateral, continuous with the cartilage-pit on the posterior side of the right valve: *inside* glossy: *scars* irregularly triangular. L. 0.4, B. 0.6.

'Porcupine' Exp. 1870: Atl. St. 16. A perfect but dead specimen.

Differs from *N. rostrata* in being more compressed, and in having a short, broad, and keeled rostrum, which is not, as in that species, abruptly pinched up and elongated. I should have preferred the specific name *elegans* for the shell which I have now described; but it has been used by Mr. Hinds for a species from the 'Sulphur' Expedition.

7. *NEERA ROSTRATA*, Spengler.

*Mya rostrata*, Spengl. in Skrivt. Selsk. iii. p. 42, t. ii. f. 16.

*N. rostrata*, B. C. iii. p. 51; v. p. 191, pl. xlix. f. 3.

'Porcupine' Exp. 1869: St. 1, 6, 10, 13, 14, 18, 25, 61. 1870:

<sup>1</sup> Slender.

Atl. 6, 9, 13, 17, 24, 25, C. Sagres, 27-28a, 36; Med. Capo de Gata, Cartagena B., 55, Adventure Bank, off Rinaldo's Chair.

*Distribution.* Loffoden Is. to Shetland and the North Sea, Bay of Biscay, Mediterranean and Adriatic, New England, G. Mexico, off Barbadoes ('Blake' Exp.), off Patagonia; 10-645 fms.

*Fossil.* Miocene: N.W. Germany. Pliocene: Monte Mario and Sicily.

Closely allied to *N. chinensis* of Gray. According to Aradas and Benoit the present species is *N. ardiniana* of Biondi. The animal is pale yellowish-white: *mantle* having its edges pouting and folded back: *tube* cylindrical, extensile, and white, fringed with a few short cirri, which are bulbous at their extremities: *foot* tongue-shaped, white.

8. *NEÆRA BICARINATA*<sup>1</sup>, Jeffreys. (Plate LXXI. fig. 1.)

*N. bicarinata*, Jeffr. in Ann. & Mag. N. H. Dec. 1876, p. 496.

*SHELL* slightly inequivalve, pear-shaped, somewhat compressed, thin, semitransparent, and glossy: *sculpture*, irregular concentric striæ, which in a fragment of a larger specimen become wrinkles; the rostrum has two slight ridges or keels running outwards from the beak, the upper being nearly parallel with the hinge-line, and the lower forming with it an acute angle: *colour* whitish: *margins* rounded on the anterior side, having a less degree of curvature in front; the rostrum or posterior side is defined by a shallow indentation; it is broad and angular, with a blunt point; dorsal margin straight: *beaks* calyciform, incurved towards the anterior side; umbones slightly prominent: *cartilage-pit* small, obliquely oval: *hinge-line* straight: *hinge-plate* thin, except under the beak: *teeth*, a short and nearly erect lateral on the posterior side of the right valve: *inside* glossy: *muscular scar* on the posterior side triangular and distinct. L. 0.3, B. 0.45.

'Porcupine' Exp. 1870: Atl. St. 16, 17 (valves).

*Distribution.* North Atlantic ('Valorous' Exp.; a fragment), Bay of Biscay ('Travailleur' Exp.); 690-733 fms.

9. *NEÆRA TERES*<sup>2</sup>, Jeffreys. (Plate LXXI. fig. 2.)

*SHELL* triangular, convex, thin, semitransparent and glossy: *sculpture*, smooth, with the exception of some wrinkly striæ across the rostrum and a ridge or keel extending diagonally from the beak to the lower extremity of the rostrum; occasionally there is a second but fainter ridge, as in the last species: *colour* whitish: *epidermis* thin, light yellowish-brown: *margins* rounded on the anterior side and in front; rostrum short, separated or defined by a slight indentation, and ending in a somewhat truncated point; dorsal margin nearly straight: *beaks* small, calyciform, incurved anteriorly; umbones prominent: *cartilage-pit* small, oblong, and placed obliquely: *hinge-line* raised on the anterior, and somewhat incurved on the posterior side: *teeth*, a short triangular lateral on each side of the

<sup>1</sup> Double-keeled.

<sup>2</sup> Rounded off.

right valve, that on the posterior side extending through the middle of the rostrum: *inside* polished: *scars* strongly marked on the posterior side. L. 0·275, B. 0·35.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17*a*, 22, 31-34. Several valves and a small living specimen.

*Distribution.* Off Josephine Bank and the Azores ('Josephine' Exp.), G. Mexico; 138-790 fms.

10. *NEERA DEPRESSA*<sup>1</sup>, Jeffreys. (Plate LXXI. fig. 3.)

SHELL oval, wedge-shaped on the posterior side, depressed or somewhat flattened, thin, semitransparent, rather glossy: *sculpture*, fine and close-set minute concentric striæ in front and on the rostrum, besides occasional lines of growth: *colour* whitish: *epidermis* filmy, apparent only on the front edge and rostrum: *margins* rounded on the anterior side and more gently curved in front; rostrum wedge-shaped, not defined by any indentation, somewhat truncated at the extremity; dorsal margin raised and parallel with the beak on the anterior side, sloping and slightly incurved on the other side: *beaks* blunt, scarcely incurved; umbones small and not very prominent: *cartilage-pit* small, obliquely projecting inwards, and resembling a tooth: *hinge-line* curved on the anterior and sloping on the other side: *hinge-plate* thickened near the beak on each side: *teeth*, a single laminar lateral on the posterior side of the right valve, nearly parallel with the hinge-plate: *inside* glossy: *scar* of the posterior adductor muscle acutangular, defined beneath by a ridge. L. 0·2, B. 0·3.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17*a*. Numerous valves.

Differs from *N. exigua* in not being globose, having close-set concentric striæ in front and on the posterior side, and in the rostrum being angulated and straight. The lateral tooth also is quite different; and the ridge which defines the posterior adductor muscle in the present species is characteristic.

B. Striated concentrically. AULACOPHORA.

11. *NEERA LAMELLOSA*, M. Sars.

*N. lamellosa*, M. Sars, Arct. Molluskf. v. Norges nordlige Kyst (1858), p. 62.

*N. jugosa*, G. O. Sars, Moll. reg. arct. Norv. p. 88, t. 6. f. 9, *a-c.*

'Lightning' Exp. St. 2, 3.

'Porcupine' Exp. 1869: St. 23, 23*a*, 25, 61. And var. *koreni*: more or less smooth or wanting the concentric ridges, and having a broader rostrum. 1870: Atl. 3, 9, 12.

*Distribution.* Finnmark to Bergen coast, Bay of Biscay, Palermo, New England; 50-552 fms.

*Fossil.* Pliocene; Calabria and Messina.

I am now inclined to consider the recent species distinct from *N. jugosa* of the Coralline Crag. The fossil species is regularly tri-

<sup>1</sup> Depressed.

angular and has no distinct rostrum; but it may have been the ancestor of the recent species.

12. *NEERA CONTRACTA*<sup>1</sup>, Jeffreys. (Plate LXXI. fig. 4.)

SHELL transversely oblong, convex, thin, opaque, lustreless: *sculpture*, 25-30 riblets or raised striæ in the line of growth, those on the rostrum being at a right angle to the rest: the rostrum is sometimes angulated and keeled: *colour* whitish: *margins* rounded on the anterior side, contracted and gently curved in front, whence there is a gradual slope to the snout-like rostrum; posterior side having a truncated extremity; dorsal margin somewhat incurved: *beaks* small, blunt, intorted and sunken; umbones prominent: *cartilage-pit* narrow, oblique: *hinge-line* slightly curved on the anterior and nearly straight on the posterior side: *hinge-plate* reflected anteriorly, and somewhat thickened posteriorly: *teeth*, a single slight laminar lateral on the posterior side of the right valve, parallel with the hinge-plate, and extending to the upper end of the rostrum: *inside* glossy: *muscular scars* large and distinct. L. 0·2, B. 0·35.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17a. Several valves.

Easily distinguishable from *N. lamellosa*, not merely by its greater size, but by its narrow or contracted shape and proportionally large rostrum; the lateral tooth also, in *N. lamellosa*, is triangular and short, not laminar and elongated as in the present species. Another species, from the 'Challenger' Expedition, has been named *coarctata* (*coarctata*) by Mr. Watson.

13. *NEERA SEMISTRIGOSA*<sup>2</sup>, Jeffreys. (Plate LXXI. fig. 5.)

SHELL oval-oblong, convex, thin, semitransparent, and rather glossy: *sculpture*, 12-15 delicate concentric riblets on the posterior side only; the rostrum is closely wrinkled across; and the rest of the shell is smooth: *colour* clear white: *margins* rounded, somewhat wedge-shaped on the anterior side, gently convex in front, and sloping upwards to the posterior side; rostrum slightly upturned, short and broad, defined by a shallow indentation, with a truncated extremity; dorsal margin interrupted by the umbo, raised on the anterior, and nearly straight on the other side: *beaks* sunken, small, and mamillar; umbones prominent: *cartilage-pit* pear-shaped, lying obliquely under the beak: *hinge-line* corresponding with the dorsal margin: *hinge-plate* thin, reflected on the anterior side: *teeth*, a long laminar lateral on each side of the right valve, that on the posterior side being triangular in the middle: *inside* polished: *muscular scars* triangular and large. L. 0·25, B. 0·4.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17a.

Allied to *N. notabilis*; but the shape of the present species is more oval or oblong, the concentric ridges are less numerous and are confined to the posterior side, the rostrum is broader and not keeled and is separated by a shallow indentation, and the lateral teeth are much larger.

<sup>1</sup> Contracted.

<sup>2</sup> Half-wrinkled.

14. *NEÆRA* *CIRCINATA*, Jeffreys. (Plate LXXI. fig. 6.)*N. circinata*, Jeffr. in Ann. & Mag. N. H. Dec. 1876, p. 497.

'Porcupine' Exp. 1869: St. 23 (a fragment). 1870: Atl. 16 (a small valve).

*Distribution.* Bay of Biscay ('Travailleur' Exp.), N. Atlantic ('Valorous' Exp.), W. of Azores ('Challenger' Exp.); 600-1450 fms.*N. imbricata*, Jeffr. MS., is a synonym.15. *NEÆRA* *RUGINOSA*<sup>1</sup>, Jeffreys. (Plate LXXI. fig. 7.)

SHELL roundish-oval, somewhat depressed, thin, semitransparent, and rather glossy: *sculpture*, numerous fine and concentric minute striae, which become wrinkly towards and on the posterior side: *colour* white: *margins* rounded equally on the anterior side and in front; rostrum very short and obliquely truncated; dorsal margin lying beneath the umbo, short and scarcely curved on the anterior side, half as long again and straight on the other side: *beaks* minute, circular, and sunken; umbo small and prominent: *cartilage-pit* minute, narrow, and placed obliquely: *hinge-line* nearly straight: *hinge-plate* thin, slightly reflected on the anterior side: *teeth*, none in the left valve, the right valve not having been found: *inside* polished: *scars* inconspicuous. L. 0·1, B. 0·15.

'Porcupine' Exp. 1870: Atl. St. 17, 17a. Three left valves only.

This small species might be mistaken for the young of *N. circinata*; but the sculpture is very different, and the rostrum is much shorter.16. *NEÆRA* *INFLATA*<sup>2</sup>, Jeffreys. (Plate LXXI. fig. 8.)

SHELL equivalve, roundish-oval, with an oblique outline, gaping posteriorly, globose, rather solid, semitransparent, and glossy: *sculpture*, very numerous, fine, and close-set concentric striae, which are observable with the naked eye; they are more irregular and sometimes wanting, or become wrinkly, on the rostrum: *colour* pale yellowish-white: *epidermis* filmy: *margins* rounded on the anterior side and in front; rostrum short and bluntly pointed, appearing as if pinched up, and separated or defined by a shallow indentation; it is occasionally somewhat angulated and marked by a slight keel or ridge, which is more distinct in the young; dorsal margin upraised on the anterior and down-sloping on the posterior side: *beaks* triangular, incurved towards the anterior side; umbones very prominent: *cartilage-pit* oblong, narrow, and obliquely projecting inwards: *hinge-line* obtuse-angled: *hinge-plate* thin, a little reflected anteriorly: *teeth*, a small upright triangular cardinal and a long laminar lateral on each side in the right valve, besides a long laminar lateral on the posterior side, and parallel with the hinge-plate in the left valve: *inside* polished, furnished on the posterior side in each valve with a strong and curved laminar process or ridge, which apparently

<sup>1</sup> Wrinkled.<sup>2</sup> Swollen.

supports the adductor muscle on that side: *scars* otherwise inconspicuous. L. 0.4, B. 0.65.

'Porcupine' Exp. 1869: St. 39. 1870: Atl. 16, 17a.

*Distribution.* Off Gomera, Azores ('Challenger' Exp.); 620 fms.

#### C. Keeled. TROPIDOPHORA.

##### 17. NEÆRA ABBREVIATA, Forbes.

*N. abbreviata*, Forb. in Proc. Zool. Soc. 1843, p. 75: B. C. iii. p. 48; v. p. 191, pl. xlix. f. 2.

'Porcupine' Exp. 1869: St. 10, 13, 18. 1870: Atl. 9, 36; Med. 55, Adventure Bank, off Rinaldo's Chair.

*Distribution.* Finmark to W. Scotland, W. France and Bay of Biscay, N. Spain, Mediterranean from Naples to the Ægean; 4-552 fms.

*Fossil.* Pliocene: Belgium, S. France, Sicily.

*N. vitrea* of Lovén, and *Corbula reflexa* of O. G. Costa according to Aradas and Benoit. The shell frequently wants the concentric plaits or folds.

##### 18. NEÆRA ANGULARIS, Jeffreys. (Plate LXXI. fig. 9.)

*N. angularis*, Jeffr. in Ann. & Mag. N. H. Dec. 1876, p. 498.

'Porcupine' Exp. 1870: Atl. St. 16, 17, 17a. A living specimen and a few valves.

*Distribution.* G. Mexico (*Pourtales*), N. Atlantic ('Valorous' Exp.); 290-1785 fms.

A lovely shell.

#### D. Ribbed lengthwise. SPATHOPHORA.

##### 19. NEÆRA CURTA<sup>1</sup>, Jeffreys. (Plate LXXI. fig. 10.)

*N. curta*, Jeffr. in Ann. & Mag. N. H. Dec. 1876, p. 495.

**SHELL** roundish-oval, with an oblique outline, globose, thin, opaque, and lustreless, but semitransparent and glossy when young: *sculpture*, numerous longitudinal sharp ribs on the posterior side, and striæ in the same direction on the other side, as well as usually on the rostrum; the sculpture of the rostrum, however, is irregular, sometimes consisting of a single transverse riblet, and in other specimens of more than a dozen striæ, and occasionally the rostrum is quite smooth; there are also close-set and wavy concentric lines of growth, which are crossed by the longitudinal sculpture: *colour* white: *margins* rounded on the anterior side, with an oblique truncature above, gently curved in front; rostrum short, abruptly pinched up and rounded at the point; dorsal margin on a level with the umbo on the anterior side and incurved on the other side: *beaks* minute, inflected, and sunk; umbones prominent: *cartilage-pit* small, triangular, placed immediately below the beaks: *hinge-line* flexuous: *hinge-plate* thin and reflected on the anterior side, thickened on the posterior side: *teeth*, a short strong triangular lateral

<sup>1</sup> Short.

on the posterior side of the right valve, which becomes laminar towards the upper part of the rostrum; it commences below the beak, and is connected on the side with the outer ridge or wall of the cartilage-pit: *inside* glossy; edges notched by the ribs: *muscular scars* triangular, large, and well marked on the posterior side, and strengthened by a short upright plate. L. 0.4, B. 0.55.

'Porcupine' Exp. 1870: Atl St. 16, 17, 24-28a.

*Distribution.* Off Bermuda ('Challenger' Exp.), Azores ('Josephine' Exp.); 200-600 fms.

May be distinguished at all ages from *N. costellata* by its more globular shape and much shorter rostrum, and by the greater continuity of the ribs on the posterior side. See also my remarks in the 'Annals and Magazine of Natural History' for December 1876 in comparison of the present species with *N. striata*.

## 20. *NEERA COSTELLATA*, Deshayes.

*Corbula costellata*, Desh. Expl. Scient. Mor. (Géol.), p. 86, t. vii. f. 1-3.

*N. costellata*, B. C. iii. p. 49; v. p. 191, pl. xlix. f. 3.

'Porcupine' Exp. 1869: St. 1, 6, 10, 13, 14, 25, 35, 61. 1870: Atl. 1, 2, 3, 3a, 9, 10, 13, Setubal B., C. Sagres, 26-29; Med. Cartagena B., 55, Rasel Amoush, Adventure Bank.

*Distribution.* Bergen to G. Egina, Adriatic, Madeira, Canaries, Jamaica?, G. Mexico? ('Blake' Exp.), New England; 10-250 fms.

*Fossil.* Miocene: W. Indies? Pliocene: Belgium, N. France, Italy, Morea.

*Anatina radiata* and *A. ruggeri* of Maravigna, according to Aradas and Benoit, besides other synonyms given in 'British Conchology.'

## 21. *NEERA STRIATA*, Jeffreys. (Plate LXXI. fig. 11.)

*N. striata*, Jeffr. in Ann. & Mag. N. II. Dec. 1876, p. 495.

'Lightning' Exp.: St. 4, 6 (living).

'Porcupine' Exp. 1869: St. 23 (living), 23a (fragment).

*Distribution.* N. Atlantic ('Valorous' Exp.), between Norway and Novaya Sembla ('Vöringen' Exp.), between the Butt of Lewis and the Faroe Isles ('Knight Errant' cruise), Bay of Biscay ('Travailleur' Exp.), New England?; 85-1450 fms.

Probably *N. multicostata* of Verrill and Smith; but I have not yet been favoured with the promised opportunity of comparing specimens.

## 1. *CORBULA GIBBA*, Olivi.

*Tellina gibba*, Olivi, Zool. Adr. p. 101.

*C. gibba*, B. C. iii. p. 56, pl. ii. f. 5; v. p. 192, pl. xlix. f. 6.

'Porcupine' Exp. 1869: St. 1, 2 (and var. *rosea*), 6, 9, 16, 18 (fry), Donegal B. (var.), 19 (fry), 21 (fry), 23a, 25. The Minch, Loch Torridon, off Lerwick. 1870: Atl. 10, Vigo B., 13, Setubal B., C. Sagres, 26, Tangier B.; Med. Cartagena B., 50, 55 (fry), G. Bona, Benzert Road, Rasel Amoush, Tunis B., Adventure Bank.



*Distribution.* Hammerfest to the Ægean; coast of Syria and Sea of Marmora, Adriatic, Mogador, Canaries; 0-130 fms.

*Fossil.* Miocene: Vienna Basin and the greater part of the European continent, Calabria, "America" (*Lyell*)? Pliocene: Coral-line and Red Crag, Belgium, S.W. and S. France, Lisbon, Italy, Algeria, Greece, Kos, Crete, Rhodes, and Cyprus. Post-tertiary: Norway, Sweden, British Isles, Calabria; 0-1360 ft. Not *C. gibba* of Philippi, from N.W. Germany, nor *C. striata* of Lamarck, which is an Eocene fossil from Grignon. Mr. Searles Wood adopted as a specific name *striata* of Walker and Boys; but that was a sentence, and not a name in accordance with the binomial method. There are many other obsolete synonyms.

## 2. CORBULA MEDITERRANEA, Costa.

*C. mediterranea*, O. G. Costa, Descr. Test. Sic. 1828, p. 182; Cat. Sist. 1829, p. xxvi, t. 1. f. 6: B. C. iii. p. 58; v. p. 192, pl. c. f. 8.

'Porcupine' Exp. 1870: Atl. 26, Tangier B.; Med. Algesiras B.

*Distribution.* Cork and Guernsey (valves only), Mediterranean and Adriatic; 20-120 fms.

*Fossil.* Pliocene: Sicily. Post-tertiary: Isle of Bute, Calabria.

Syn. *Tellina parthenopæa* of D. Chiaje (Philippi), and *C. phytoides* of Deshayes. *C. ovata* of Forbes, which is closely allied to the present species, is the same species as *C. amurensis* of Schrenck, and perhaps *C. laevis* of Hinds. The late Dr. Mörch informed me that Prof. Krøyer had found two specimens of the last-mentioned species at Christiansund, and that specimens (kindly sent me by Mörch) were from the collection of Fabricius, who might have taken them either in Greenland or Norway. Fabricius was a clergyman, and had the charge of a parish in Norway after he had been a missionary in Greenland. Forbes's specimen may have come from one of the glacial deposits in the Isle of Man, which have been described by the Rev. J. Clifton Ward in the 'Geological Magazine' for January 1880.

## Family XXI. MYIDÆ.

### 1. MYA TRUNCATA, Linné.

*M. truncata*, L. S. N. p. 1112: B. C. iii. p. 66, pl. iii. f. 1; v. p. 192, pl. l. f. 2.

'Porcupine' Exp. 1869: St. Donegal B., 70 (var. *uddevallensis*, a semifossil valve).

*Distribution.* Circumpolar in the northern hemisphere, ranging southwards in the N. Atlantic to S.W. France on the east and to Cape Cod on the west, and in the N. Pacific to N. Japan on the east and Vancouver I. on the west, Tuscany?, Adriatic?, Black Sea?; 0-1333 fms. Living down to 80 fms.; at the greatest depths valves only from the walrus or cod.

*Fossil.* Pliocene: English Crag. Post-tertiary: from Spitzbergen and Siberia to Sicily on the east, and from N. lat. 82° 35' to Canada on the west; 0-1360 ft.

Synonyms numerous. The shell referred to by Gmelin for his *Mya membranacea* from the figure in Olafsen and Povelsen's 'Voyage to Iceland' (t. xi. f. 10) is apparently the young of *Mya truncata*. That which Müller described and Gmelin named also *Mya membranacea* was probably *Lyonsia norvegica*.

## 2. *MYA BINGHAMI*, Turton.

*Sphenia binghami*, Turt. Dith. p. 36, t. 3. f. 4, 5, and t. 19. f. 3.  
*M. binghami*, B. C. iii. p. 70; v. p. 192, pl. 1. f. 3.

'Porcupine' Exp. 1870: Atl. St. Tangier B.

*Distribution*. Loffoden Is. to Bay of Naples and Tunis;  $4\frac{1}{2}$ –40 fms.

*Fossil*. Miocene: Lapugy in Transylvania. Pliocene: Coral-line and Red Crag. Post-tertiary: Larne, co. Antrim.

The genus *Sphenia* of Turton is a mere synonym of *Mya*. All the characters given by him to distinguish it from *Mya* are the same in both. His *S. swainsoni* is the young of *M. truncata*.

## Family XXII. SAXICAVIDÆ.

### PANOPEA PLICATA, Montagu.

*Mytilus plicatus*, Mont. Test. Brit. Suppl. p. 70.

*P. plicata*, B. C. iii. p. 75, pl. iii. f. 2; v. p. 192, pl. li. f. 1.

'Porcupine' Exp. 1869: St. 9, 18, Donegal B. 1870: Atl. Vigo B., 24; Med. Adventure Bank.

*Distribution*. Loffoden Is. to Algiers and Sicily, Canaries, Korea; 5–628 fms.

*Fossil*. Miocene: Cassel. Pliocene: Coralline and Red Crag, Belgium, Italy. Post-tertiary: Belfast.

There are several generic and specific synonyms.

### SAXICAVA RUGOSA, Linné.

*Mytilus rugosus*, L. S. N. p. 1156.

*S. rugosa*, B. C. iii. p. 81, pl. iii. f. 3; v. p. 192, pl. li. f. 3, 4.

'Lightning' Exp.: St. 1, 2, 4, 5.

'Porcupine' Exp. 1869: St. 1, 2, 6, 9, 10, 14, 17, 23a, 35, 62, 65 (and semifossil valve of arctic or glacial type). 1870: Atl. 3, 3a, 9, 10, 12, Vigo B., 13, Setubal B., 26–28, 36; Med. G. Bona, Rasel Amoush, G. Tunis, Adventure Bank.

*Distribution*. Type and variety *arctica*, apparently everywhere in every sea throughout the world, at every depth from low water to 1622 fms.

*Fossil*. Miocene, Pliocene, and Post-tertiary: nearly every part of Europe, northern Asia, and North America; 0–1360 ft.

This ubiquitous and variable shell has received more than twenty names in respect of its genus and species. Linné placed the type and some of the varieties in *Mytilus*, *Solen*, and *Mya*. The date of publication is the same for *Mytilus rugosus* and *Mya arctica*; but the former specific name is more generally used. I have therefore treated the latter name as varietal.

## Family XXIII. PHOLADIDÆ.

PHOLAS CANDIDA, Linné.

*P. candidus*, L. S. N. p. 1111.*P. candida*, B. C. iii. p. 107; v. p. 193, pl. lii. f. 2.

'Porcupine' Exp. 1870: Med. St. 50 (fragment).

*Distribution*. Coasts of Scotland to Sicily, Adriatic, Black Sea, Mogador; low water<sup>1</sup>.*Fossil*. Pliocene: S. Miniato, Tuscany. Post-tertiary: Norway, England, and Belfast; 0-600 ft.

XYLOPHAGA DORSALIS, Turton.

*Teredo dorsalis*, Turt. Conch. Dict. p. 185.*X. dorsalis*, B. C. iii. p. 120, pl. iv. f. 3; v. p. 193, pl. liii. f. 4.

'Porcupine' Exp. 1869: St. 5 (valves). 1870: Cartagena B. (in floating wood), Adventure Bank (valves).

*Distribution*. Loffoden Is. to Sicily, Adriatic, G. St. Lawrence to Cape Cod; 0-650 fms.*Fossil*. Miocene: Vienna Basin, Calabria. Pliocene and Post-tertiary: Calabria.

## SUMMARY OF THE FOREGOING LIST.

Families.	Genera.	No. of species.
XVI. MACTRIDÆ .....	AMPHIDESMA .....	2
	MACTRA .....	3
	LUTRARIA .....	3
	SCROBICULARIA .....	6
XVII. SOLENIDÆ .....	SOLECURTUS .....	2
	CERATISOLEN .....	1
	SOLEN .....	3
XVIII. PANDORIDÆ .....	PANDORA .....	1
	LYONSIA .....	3
	PECCHIOLOIA .....	7
	PHOLADOMYA .....	1
XIX. ANATINIDÆ .....	THRACIA .....	5
XX. CORBULIDÆ .....	POROMYA .....	2
	NEÆRA .....	21
	CORBULA .....	2
XXI. MYIDÆ .....	MYA .....	2
XXII. SAXICAVIDÆ .....	PANOPEA .....	1
	SAXICAVA .....	1
XXIII. PHOLADIDÆ .....	PHOLAS .....	1
	XYLOPHAGA .....	1
Total.....		68

<sup>1</sup> Professor Lovén gave Norway as a habitat on Spengler's authority; but *P. papyraceus* of Solander, referred to by Spengler in the 'Skriver af Naturhistorie-Selskabet' (ii. i. 92), is there stated to be "medio sulco notata," which character belongs to *P. crispata*, and not to *P. candida*; and the habitat given by Spengler was Schleswig or South Jutland in the North Sea. Spengler's figure, however, represents *P. candida*.

In concluding the lists of the Brachiopoda and Conchifera procured during the Expeditions of H.M.S. 'Lightning' and 'Porcupine' from 1868 to 1870, I may explain that the delay of publication, although considerable, was unavoidable; but it has not been without some compensation. Since that period several important and extensive deep-sea explorations have been made from Germany, Norway, Holland, France, Italy, the United States, Canada, and Great Britain, the results of which have greatly tended to increase and improve our knowledge of the geographical and hydrographical distribution of the Mollusca in the North Atlantic. Moreover the careful investigation of the Tertiary and Post-tertiary shells by Professor Seguenza and a host of other able palæontologists has enabled us to ascertain more exactly the range of their geological position. I should be inclined to regard as last in the order of scientific value the discovery of what are called "new species." We know very little—too little—of the abyssal fauna; but it is evident that every exploration of the oceanic bed must produce an endless number of hitherto unpublished forms, to say nothing of those forms which some naturalists, anxious for that kind of fame, continually contrive to manufacture out of the varieties of recorded species.

#### SUPPLEMENT TO PARTS I., II., III.

##### Part I., P. Z. S. 1878:—

- Page 398. With respect to the so-called genus *Waldheimia*, my friend Mr. Davidson, in his Report on the Brachiopoda from the 'Challenger' Expedition, says that "there exists in the dorsal valve of *Waldheimia* a median septum, which is not present in *Terebratula*." But some of those species of *Terebratula* which he there places in *Waldheimia* (c. g. *T. cranium* and *T. tenera*) have no such septum. *Rhynchonella psittacea* has no septum, while *R. sicula* has one. That character, therefore, will not serve for generic distinction.
- P. 399. *Argiope cistellula*. Fossil. Calabria.  
 „ *Platydia anomioïdes*. Fossil. Calabria.
- P. 400. *Rhynchonella sicula*. Fossil. Calabria.  
 „ *Crania anomala*. Fossil. Monte Mario and Calabria.
- P. 401. *Terebratula caput-serpentis*. The range of depth for other localities, besides those given for the 'Lightning' and 'Porcupine' Expeditions, should be 400 fms. The variety *mediterranea* is *T. emarginata* of Risso.
- P. 402. *Terebratula tuberata*. North of Spain ('Travailleur' Exp., 1881).  
 „ *Terebratula subquadrata*. Bay of Biscay ('Travailleur' Exp.), very young specimens; 645 fms.
- P. 404. *Terebratula vitrea*, var. *sphenoïdea*. N. Spain ('Travailleur' Exp., 1881).
- P. 405. *Terebratula cranium*. Bay of Biscay ('Travailleur' Exp.) 1011 fms.

- P. 405. *Terebratula septata*. N. Spain and off Marseilles ('Travailleur' Exp., 1881); 295 fms.  
 P. 409. *Terebratella spitzbergensis*. Barentz Sea; 128 fms.  
 P. 410. *Argiope capsula*. Jersey, at low water; specimens nearly twice the recorded size. See 'Annals & Magazine of Natural History,' December 1880, for a further account of the skeleton. There is no septum.  
 P. 411. *Platydia anomioides*. Bay of Biscay ('Travailleur' Exp.), North of Stornoway ('Knight Errant' cruise), off Cuba and West Indies ('Blake' Exp.); 88-645 fms.  
 „ *Megerlia truncata*. Bay of Biscay ('Travailleur' Exp.); 236 fms.  
 P. 412. *Thecidea mediterranea*. G. Mexico ('Blake' Exp.); 163 fms.  
 P. 413. *Rhynchonella sicula*. N. Spain ('Travailleur' Exp., 1881).  
 P. 415. *Discina atlantica*. Off the coasts of N. Australia ('Challenger' Exp.); 200, 360, and 1400 fms.

Part II., P. Z. S. 1879 :—

- P. 554. *Anomia ephippium*. Fossil. Miocene: Calabria (*Seguenza*).  
 P. 555. *Anomia patelliformis*. Fossil. Miocene: Calabria (*Seg.*).  
 „ *Ostrea cochlear*. Fossil. Post-tertiary: Calabria.  
 P. 556. *Spondylus gussoni*. Gulf of Mexico, Bay of Biscay ('Travailleur' Exp.); 270-645 fms. Fossil. Post-tertiary: Calabria.  
 P. 557. *Pecten pes-felis*. Fossil. Post-tertiary: Calabria.  
 „ *Pecten pes-lutra*. The depth ranges from 5 instead of 10 fms.  
 „ *Pecten sulcatus*. Fossil. Add Calabria.  
 P. 558. *Pecten philippii*. Cap Breton. Fossil. Post-tertiary: Calabria.  
 P. 559. *Pecten flexuosus*. Fossil. Post-tertiary: Sussex.  
 „ *Pecten striatus*. 'Lightning' Exp. St. 5.  
 P. 560. *Pecten testæ*. Fossil. Pliocene and Post-tertiary: Calabria.  
 „ *Pecten similis*. Range of depth to 645 fms. Fossil. Miocene: Calabria (*Seg.*). For synonymy of this and other species see 'British Conchology.'  
 „ *Pecten groenlandicus*. Barentz Sea, Bay of Biscay ('Travailleur' Exp.); 128-645 fms.  
 P. 561. *Pecten fragilis*. Azores and Marion I. ('Challenger' Exp.), Bay of Biscay ('Travailleur' Exp.); 146-1375 fms.  
 „ *Pecten vitreus*. North Sea, Bay of Biscay ('Travailleur' Exp.); 186-733 fms. Fossil. Add Calabria. *P. abyssorum* is not even a well-marked variety.  
 „ *Amussium fenestratum*. Bay of Biscay ('Travailleur' Exp.), New England?; 86-1011 fms. Fossil. Add Calabria. This specific name has the priority of eleven years over *inæquisculptus*. Names cannot be arbitrarily changed because they are not so appropriate as those of later date. In the present instance the newer name is applicable to all the species of the genus. *Pecten hyalinus* is also a species of *Amussium*.

- P. 562. *Amussium hoskynsi*. North Sea; 106 fms. N. Spain and off Marseilles ('Travailleur' Exp., 1881), 295 fms.; New England (*Ferrill*), 86 fms. Syn. *Pecten mammillatus*, M. Sars, *Pleuronectia dissimilis*, Seguenza.
- " *Amussium lucidum*. Bay of Biscay ('Travailleur' Exp.), 600-733 fms.; Caribbean Sea and G. Mexico ('Blake' Exp.), 13-805 fms.
- " *Lima sarsii*. North Sea; 135-217 fms. *Fossil*. Miocene and Pliocene: Calabria.
- P. 563. *Lima elliptica*. Bay of Biscay ('Travailleur' Exp.), 536-600 fms.; G. Mexico, 169 fms.
- " *Lima subovata*. New England, 255-500 fms.
- P. 564. *Lima hians*. *Fossil*. Add Calabria.
- " *Lima excavata*. *Fossil*. Add Calabria.
- P. 565. *Avicula hirundo*, var.? New England, 65-192 fms.
- " *Mytilus edulis*. Black Sea. *Fossil* (var. *ungulata*). Post-tertiary: Calabria.
- P. 566. *Mytilus adriaticus*. Black Sea; Jersey, living between tide-marks.
- P. 567. *Mytilus barbatus*. *Fossil*. Post-tertiary: Calabria.
- " *Mytilus phaseolinus*. For 3000 read 300 fms.
- P. 568. *Modiolaria marmorata*. Bay of Biscay ('Travailleur' Exp.), 591 fms.; Firth of Forth, living at low water.
- " *Modiolaria discors*. *Fossil*. Pliocene and Post-tertiary: Calabria.
- " *Modiolaria subclavata*. Bay of Biscay ('Travailleur' Exp.); 591 fms. *Fossil*. Pliocene: Calabria.
- P. 569. *Crenella decussata*. Barbadoes ('Blake' Exp.); 100 fms. Specimen from Queen-Charlotte Islands measuring nearly twice the usual size.
- " *Dacrydium vitreum*. Bay of Biscay ('Travailleur' Exp.), 1011 fms.
- P. 570. *Arca barbata*. *Fossil*. Post-tertiary: Calabria.
- " *Arca lactea*. Bay of Biscay ('Travailleur' Exp.), 628 fms.; Bermuda.
- P. 571. *Arca noæ*. *Fossil*. Post-tertiary: Calabria.
- " *Arca antiquata*. *Fossil*. Post-tertiary: Calabria.
- P. 572. *Arca obliqua*. *Fossil*. Post-tertiary: Calabria.
- " *Arca glacialis*. Barentz Sea, 128 fms.; New England, southern coast, 85-500 fms. Professor Verrill considers *A. pectunculoïdes* a variety of the present species.
- " *Arca pectunculoïdes*. New England, southern coast, 85-225 fms.; G. Mexico ('Blake' Exp.), 400-1568 fms.
- P. 573. Var. *septrionalis*. Novaya Sembla, 210 fms.; Bay of Biscay ('Travailleur' Exp.), 552-733 fms. *Fossil*. Miocene: Calabria (*Seg.*).
- P. 574. *Leda pernula*. Barentz Sea, 128 fms.
- " *Leda minuta*. 'Lightning' Exp. St. 5.
- P. 575. *Leda fragilis*. *Fossil*. Post-tertiary: Calabria.
- " *Leda pella*. *Fossil*. Post-tertiary: Calabria.

- P. 576. *Leda messanensis*. Bay of Biscay ('Travailleur' Exp.), 367-1011 fms.; G. Mexico ('Blake' Exp.), 100-1002 fms.
- „ *Leda pustulosa*. Bay of Biscay ('Travailleur' Exp.), 1011 fms.
- „ *Leda frigida*. New England, 365 fms. *Fossil*. Miocene: Calabria (*Seg.*). Post-tertiary: Glasgow.
- P. 577. *Leda tenuis*. Bay of Biscay ('Travailleur' Exp.), 645 fms.
- P. 578. *Leda striolata*. Bay of Biscay ('Travailleur' Exp.), 733 fms.
- „ *Leda intermedia*. Barentz Sea, 128 fms.
- „ *Leda lucida*. North Sea, 100-320 fms.; Bay of Biscay ('Travailleur' Exp.), 552-1011 fms.
- „ *Leda pusio*, var. *latior*. Bay of Biscay ('Travailleur' Exp.), 552-1011 fms.; G. Mexico, 638 fms.
- P. 579. *Leda sericea*. Bay of Biscay ('Travailleur' Exp.), 1011 fms.
- „ *Leda jeffreysi*. Bay of Biscay ('Travailleur' Exp.), 367-1011 fms; Palermo; off Ascension ('Challenger' Exp.). Var. *quadrangularis*, Dall. G. Mexico ('Blake' Exp.), 1568 fms.
- P. 580. *Leda micrometrica*. *Fossil*. Pliocene: Calabria.
- „ *Leda expansa*. Bay of Biscay ('Travailleur' Exp.), 645 fms.; New England?, southern coast.
- „ *Leda pusilla*. Off Malta; 310 fms.
- P. 581. *Nucula tenuis*. Barentz Sea, 128 fms.; G. Mexico ('Blake' Exp.), 175-450 fms.
- „ *Nucula ægeensis*. Bay of Biscay ('Travailleur' Exp.), 367-645 fms. *Fossil*. Post-tertiary: Calabria.
- P. 582. *Nucula corbuloïdes*. Bay of Biscay ('Travailleur' Exp.), 367-1011 fms.
- „ *Nucula delphinodonta*. New England, southern coast. *Fossil*. Add Calabria.
- „ *Nucula tumidula*. Bay of Biscay ('Travailleur' Exp.), 552-733 fms.; North Sea, 100-365 fms.
- P. 583. *Nucula reticulata*. I find that this specific name had been preoccupied by Mr. Hinds for another species from the Philippine Isles (P. Z. S. 1843, p. 100); and I would therefore substitute that of *cancellata* for my species.
- „ *Nucula striatissima*. Bay of Biscay ('Travailleur' Exp.), 645 fms.
- „ *Nucula sulcata*. Bay of Biscay ('Travailleur' Exp.), 183-236 fms.; off Marseilles ('Travailleur' Exp., 1881), 295 fms.
- „ *Nucula nucleus*. 'Lightning' Exp., St. 5. Jersey, living between tide-marks. Var. *radiata*. Coast of Jutland.
- P. 584. *Pectunculus nummarius*. *Fossil*. Post-tertiary: Calabria.
- P. 585. *Limopsis aurita*. G. Mexico, 30-447 fms.; off Cuba, 450 fms. N. Spain and off Marseilles ('Travailleur' Exp., 1881), 295 fms. *Fossil*. Post-tertiary: Calabria. Syn. *Pectunculus corrugatus*, Calcare.

P. 585. *Limopsis cristata*. Bay of Biscay ('Travailleur' Exp.), 586 fms.; New England, 65-155 fms.? G. Mexico ('Blake' Exp.), 640 fms.

„ *Limopsis minuta*. Bay of Biscay ('Travailleur' Exp.), 536-733 fms.; off Marseilles ('Travailleur' Exp., 1881), 295 fms. New England, 115-500 fms. G. Mexico ('Blake' Exp.), 30-805 fms. *Fossil*. Post-tertiary: Calabria.

P. 586. *Malletia obtusa*. Bay of Biscay ('Travailleur' Exp.), 536-733 fms.; North Sea, 135 fms.

„ *Malletia cuneata*. Bay of Biscay ('Travailleur' Exp.), 600-733 fms. N. Spain and off Marseilles ('Travailleur' Exp., 1881), 295 fms.

Part III., P. Z. S. 1881:—

P. 693. *Pythina setosa*. The Marquis de Monterosato has satisfied me that Dunker's species is only the young of *Cypriocardia lithophagella*; and I must therefore substitute for *setosa* the specific name given by Conti, viz. *caillati*, which is several years older than either of the names proposed by Dr. Fischer.

I take this opportunity of offering to the Marquis the best thanks of myself and other conchologists for his extremely careful and conscientious labour on the Mediterranean Mollusca, in respect not only of his critical examination of all the literature which has been published on the subject, but also of his exact comparison of typical specimens described by many authors in collections widely dispersed throughout Europe.

P. 711. *Astarte*. I regret that I cannot agree with Mr. Edgar Smith (see 'Journal of Conchology' for 1881) as to the crenulation of the front margin in certain species being a sign of maturity, which involves the question of specific distinction.

P. 715. *Venus multilamella*. Off Marseilles ('Travailleur' Exp., 1881); 295 fms.

EXPLANATION OF THE PLATES.

PLATE LXX.

Fig. 1. *Lyonsia formosa*, p. 930.

2. — *argentea*, p. 930.

3. *Peechiolia subquadrata*, p. 932.

4. — *inseulpta*, p. 932.

5. — *sinuosa*, p. 932.

6. — *angulata*, p. 933.

Fig. 7. *Pholadomya loveni*, p. 934.

8. *Poromya nearoides*, p. 936.

9. *Neera truncata*, p. 936.

10. — *sulcifera*, p. 937.

11. — *gracilis*, p. 938.

PLATE LXXI.

Fig. 1. *Neera bicarinata*, p. 939.

2. — *teres*, p. 939.

3. — *depressa*, p. 940.

4. — *contracta*, p. 941.

5. — *semistrigosa*, p. 941.

6. — *circinata*, p. 942.

Fig. 7. *Neera ruginosa*, p. 942.

8. — *inflata*, p. 942.

9. — *angularis*, p. 943.

10. — *curta*, p. 943.

11. — *striata*, p. 944.



5. On the Birds collected in Socotra and Southern Arabia  
by Dr. Emil Riebeck. By Dr. G. HARTLAUB, F.M.Z.S.

[Received November 4, 1881.]

(Plate LXXII.)

The birds to which I invite attention were collected during excursions to the island of Socotra and to Southern Arabia in April last. In the former place Dr. Riebeck was accompanied by the celebrated African traveller Dr. Schweinfurth.

The Socotran collection contains 42 specimens, referable to 20 species:—

Passeres . . . . .	10 species.
Picariæ . . . . .	1 „
Herodios . . . . .	1 „
Anseres . . . . .	1 „
Columbæ . . . . .	3 „
Limicolæ . . . . .	3 „
Gaviæ . . . . .	1 „

In it there are 7 species not obtained by Prof. Balfour, including a fine novelty. These species are:—

1. *Rhynchostruthus riebecki*, n. sp.
2. *Ena capensis*.
3. *Ardea purpurea*.
4. *Totanus glareola*.
5. *Fuligula nyroca*.
6. *Phalacrocorax lucidus*.
7. *Gallinula chloropus*.

Dr. Schweinfurth writes me the following notes on the Socotran localities mentioned by Dr. Riebeck on his labels:—

“In Socotra we were only on the north coast; and besides the immediate environs of Golonsir and a short excursion made by Dr. Riebeck to the west of Tamarida, we explored only the country about this latter place and the central granite mountains.

“Our longest stay was in a mountain-valley ‘Wadi Dilal’ (or Digal), and at a place called ‘Keregnigi,’ which abounds with boulders of grey granite and caverns.

“Gebel Firi is the name of one of the numerous granitic peaks of the Haygier.

“The uppermost part of Wadi Dilal is named Rischen. The country to the south of this place (above 900 metres) is situated on the northern slope of the central granitic mountains to the S.E. of Tamarida.

“Dr. Riebeck collected many birds in the plains to the east and S.E. of Tamarida, upon the rivulet conducting to the Belled el Schech, and others on the rivulet which opens near Tamarida.”

Dr. Riebeck being still in India, the scientific compilation of the ornithological portion of his collection has been confided to me by Prof. H. Welcker, of the Anatomical Institution at Halle. It contains the following species:—

# I. SOCOTRA.

## a. PASSERES.

1. *CISTICOLA INCANA*, Sclat. & Hartl. Proc. Zool. Soc. 1881, p. 166, pl. xv. fig. 1.

One adult male, agreeing in every respect with the specimen collected by Prof. Balfour.

"Iris black." Gebel Firi.

2. *LANIUS UNCINATUS*, Scl. & Hartl. Proc. Zool. Soc. 1881, p. 168, c. fig. cap.

One adult specimen.

"Iris dark brown." Karegnigi.

3. *ZOSTEROPS HABESSINICA*, Guér.

*Zosterops habessinica*, Heugl. Orn. N.O.-Afr. i. p. 413; Hartl. Monogr. in Cab. J. f. O. 1865, p. 9; Scl. et Hartl. P. Z. S. 1881, p. 168.

One adult specimen.

"Iris greyish brown." Tamarida.

4. *NECTARINIA BALFOURI*, Scl. & Hartl. Proc. Zool. Soc. 1881, p. 169, pl. xv. fig. 2.

Two adult males and one female are in the collection.

"Iris brownish red." Karegnigi and Wadi Sjahi.

5. *RHYNCHOSTRUTHUS RIEBECKI*, n. sp. (Plate LXXII.)

*Supra fusco-cinerascens, pileo fuscescenti-nigro, frontem versus nigriore, gula fusco-nigricante; macula majore regionem paroticam occupante circumscripte sericeo-alba, nonnihil fulvescenti adumbrata; remigibus primariis fuscis; tectricibus majoribus remigumque tert. marginibus externis late et dilute flavis, vittam longitudinalem valde conspicuam formantibus; scapularibus et tectricibus alarum minoribus dorso concoloribus; subalaribus albido flavidoque variis; rectrice extrema tota obsolete fusca, duabus intermediis fuscis, vix distincte flavido fimbriatis, reliquis fusco-nigricantibus, marginibus externis late flavis; subcaudalibus albidis; pectore et abdomine griseo-fulvescentibus; rostro nigro. Long. tot. circa 152 millim., culm. 14, al. 85, caud. 27, tars. 19.*

Fœm. Non diversa, exceptis pectore et abdomine purius griseis.

Of this second species of the Socotran genus *Rhynchostruthus* there is a fine adult pair in the collection. The species is quite typical in its structure, but very different in colour, and easily recognizable by the dark hue of the crown, the silky white spot on the

sides of the head, the uniform colour of the underparts, the distribution of the yellow on the wing, &c.

"Iris brown, feet flesh-coloured." Karegnigi, April 28.

6. *EMBERIZA SEPTEMSTRIATA*, Rüpp.

*E. tahapisi*, Heugl. (nec A. Smith) Orn. N.O.-Afr. p. 665.

One adult male.

"Iris dark brown, feet flesh-coloured." Wadi Dilal.

Compared with a pair of the same species from the Kir station, on the Bahr el Gebel, the only difference consists in the more rufous ground-colour of the Socotran bird, this colour being dark brown in the continental specimens.

7. *PYRRHULAUDA MELANAUCHEN*, Cab.

*Coraphites melanauchen*, Heugl. Orn. N.O.-Afr. p. 672; Sclat. & Hartl. P. Z. S. 1881, p. 172.

A fine pair in the collection.

"Iris dark brown, feet reddish white." Tamarida.

8. *AMYDRUS BLYTHI*, Hartl.

*Amydrus blythi*, Hartl. Cab. Journ. 1859, p. 31.

*A. rüppelli*, Blyth, J. As. Soc. Beng. 1856, p. 301; Finsch & Hartl. Orn. Ostaf. p. 867; Sclat. & Hartl. P. Z. S. 1881, p. 171.

Specimens of both sexes from Gollonsir, Karegnigi, and Gebel Firi.

"Iris dark brown."

9. *AMYDRUS FRATER*, Scl. & Hartl. P. Z. S. 1881, p. 171.

There are two adult males in the series from Tamarida, and a third one from Gebel Firi.

"Iris greyish brown, feet brown."

It is much to be regretted that the female of this fine new species continues unknown to us. What may be the colour of its head? One of the three specimens obtained was kindly presented to me, and now enriches the complete collection of Lamprotornithidæ in the Bremen Museum.

10. *CORVUS UMBRINUS*, Hedenb.

*Corvus umbrinus*, Sundev. Act. Stockh. 1838, p. 199; Heugl. Orn. N.O.-Afr. p. 505.

*C. infumatus*, Wagn. Münchn. Gel. Anz. 1839.

Male and female from Tamarida.

"Iris dark brown."

b. *PICARIÆ*.

11. *CENTROPUS SUPERCILIOSUS*, Hempr. & Ehr.

*Centropus superciliosus*, Heugl. loc. cit. p. 791.

Male and female from "Beled Shak."

"Iris blood-red and black."

## c. HERODIONES.

## 12. ARDEA PURPUREA, L.

*Ardea purpurea*, Heugl. Orn. N.O.-Afr. p. 1051.

One specimen, a female.

Not obtained by Prof. Balfour.

## d. ANSERES.

## 13. FULIGULA NYROCA (Güld.).

*Aythya nyroca*, Heugl. loc. cit. p. 1343.

A female from Gollonsir.

The occurrence of this Duck on the island of Socotra is rather curious, no specimen of it being known as yet from Eastern Africa or the shores of the Red Sea.

Not obtained by Prof. Balfour.

## e. COLUMBÆ.

## 14. TRERON WAALIA (Gm.).

*Treron waalia*, Heugl. loc. cit. p. 117; Sclat. & Hartl. P. Z. S. 1881, p. 175.

Four examples from Gebel Firintz.

"Iris red and blue."

## 15. TURTUR SENEGALENSIS (L.).

*Turtur senegalensis*, Heugl. loc. cit. p. 817; Sclat. & Hartl. P. Z. S. 1881, p. 173.

Two males from Karegnigi.

"Iris dark brown, feet red."

## 16. CENA CAPENSIS (L.).

*Cena capensis*, Heugl. loc. cit. p. 848.

An adult male from Gollonsir.

"Iris black."

Not in the Balfour collection.

## f. LIMICOLÆ.

## 17. TOTANUS GLAREOLA, L.

*Totanus glareola*, Heugl. loc. cit. p. 1163; Finsch & Hartl. Ostaf. p. 750.

An adult female from Gollonsir.

"Iris pale brown, feet yellowish green."

Not in the Balfour collection.

## 18. TRINGOIDES HYPOLEUCUS (L.).

*Tringoides hypoleucus*, Heugl. Orn. N.O.-Afr. p. 1172; Finsch & Hartl. Ostaf. p. 745.

A male from Gollonsir.

## 19. GALLINULA CHLOROPUS (L.).

*Gallinula chloropus*, Heugl. loc. cit. p. 1224; Finsch & Hartl. Ostafr. p. 787.

Five adult specimens.

Not obtained by Prof. Balfour.

## g. STEGANOPODES.

## 20. PHALACROCORAX LUCIDUS, Licht.

*Phalacrocorax lucidus*, Heugl. loc. cit. p. 1490; Finsch & Hartl. Ostafr. p. 846.

*Halieus lucidus*, Licht. Doubl. p. 86; Heugl. Orn. N.O.-Afr. p. 1490; Finsch & Hartl. Ostafr. p. 846.

An adult female from Tamarida.

"Iris yellowish white."

Not in the Balfour collection.

## II. SOUTHERN ARABIA.

## 1. DRYMÆCA TENELLA (?).

*Drymæca tenella*, Cab. in v. d. Deck. Reise in Ostafr. iii. p. 29, t. ii. fig. 1; Reich. Cab. Journ. 1877, p. 30.

One mile from Bolhaf. "Iris red, with a yellow ring."

In colour very much like *C. tenella*, from Lado, but with the beak smaller and slenderer. Long. culm. 8 mm., al. 46, caud. 60, tars. 18.

## 2. NECTARINIA METALLICA, Licht.

*Nectarinia metallica*, Licht. Doubl. p. 15; Hempr. & Ehr. Symb. Physic. Av. t. 1; Heugl. Orn. N.O.-Afr. p. 224.

Five adult specimens. Shagra and Bolhaf.

There are Arabian specimens of this bird in the Berlin Museum.

## 3. MEROPS CYANOPHRYS, Cab.

*Merops cyanophrys*, Heugl. Orn. N.O.-Afr. p. 203, pl. vi.; Cab. Mus. Hein. iii. p. 137.

Male and female from Hami.

"Iris brick-red." April.

This fine and little-known species was discovered by Hemprich and Ehrenberg near Qonfudah. It seems strictly confined to Arabia.

I add a short description of the birds before me, as that in Heuglin's work has evidently been taken from a much livelier-coloured specimen:—

*Supra obsolete et pallide æruginoso-virens, subcærulescenti lavatus, subtus magis in cærulescentem vergens; gula, fronte et superciliis late cyaneis; torque latiusculo gutturali striolaque per oculus ducta nigris; remigibus prim. in pogonio externo obsolete virentibus, in pogonio interno pallide fulvescentibus; tertiariis*

*dilute cinnamomeis, exsiccatis virescenti limbatis lateque nigro terminatis, supra- et subcaudalibus pallide beryllino-cærulescentibus; rectricibus duabus intermediis in mare modice elongatis, parte apicali angustata et acuminata; ala interna fere tota cinnamomeo-fulva.*

4. *PYCNONOTUS NIGRICANS*, Vieill.

*Pycnonotus nigricans*, Heugl. loc. cit. p. 397; Finsch & Hartl. Ostaf. p. 297.

A pale-coloured male specimen from Shugra.

This bird was already known from Wadi Firan, in Arabia Petrea.

5. *LANIUS ISABELLINUS*, Hempr. et Ehr.

*Lanius isabellinus*, Hempr. & Ehren. Symb. Phys. Av. fol. c.; Heugl. Orn. N.O.-Afr. p. 475; Walden, Ibis, 1867, p. 224, t. v. fig. 1.

"Iris black."

Two fine males from Shugra and Bolhaf.

Discovered by Hemprich and Ehrenberg in the mountains near Qoufudah. The late Dr. John Gould collected it in Scinde; and there are specimens from Lado (Dr. Emin Bey) in the Bremen Museum.

6. *TCHITREA MELANOGAстра*, Sw.

*Tchitreia melanogastra*, Heugl. loc. cit. p. 441; Finsch & Hartl. Ostaf. p. 300.

A young male from Hami.

This is the first time, I believe, that this well known and widely distributed African species has been found in Arabia.

7. *UROLONCHA CANTANS* (Gm.).

*Uroloncha cantans*, Heugl. loc. cit. p. 594.

*Spermestes cantans*, Finsch & Hartl. Ostaf. p. 435.

Two males from Shugra.

Arabia is a new locality for this common African species.

8. *CHRYSOSPIZA EUCHLORA* (Licht.).

*Chrysospiza euchlora*, Heugl. Orn. N.O.-Afr. p. 639; Heugl. Cab. Journ. 1868, p. 89.

*Auripasser euchlorus*, Bonap. Consp. p. 519; Cab. Mus. Hein. i. p. 157, note.

One of the most interesting discoveries of Hemprich and Ehrenberg in the mountains of Qoufudah, and in Abyssinia. Examples from both localities are in the Berlin Museum. Recent collectors have not met with this bird in Abyssinia. Is it really to be found there?

The descriptions of Heuglin and Bonaparte being incomplete and

not very good, I add a few remarks upon the birds (five specimens) before me :—

Ad. *læte citrino-flava, rectricibus, remigibus et scapularibus fusco-nigricantibus, pallide ochroleuco marginatis; tectricibus alarum minoribus et subalaribus læte flavis; subcaudalibus pallide flavidis; rostro nigricante.* Jun. *minus læte tincta, supra sordide adumbrata, capite et pectore purius flavis; mandibula pallida, apice nigricante.* Juv. *flavedine vix ulla; notæ toto sordide et obsolete ex flavido fulvescente; subtus pallidior; rostro pallescente.*

The colour of the young bird is very curious and indistinct. In the adult the dark blackish-brown tertials and scapulars, broadly margined with pale isabelline, form a most prominent feature.

A second species of the genus *Chrysospiza* is *Fringilla lutea* of Licht. (Temm. Pl. Col. 365), from Sennaar (cf. Heugl. loc. cit. p. 637).

#### 9. HYPHANTORNIS GALBULA, Rüpp.

*Hyphantornis galbula*, Heugl. loc. cit. p. 557, t. xviii. fig. d (fig. med.); Rüpp. N. Wirb. Abyss. p. 92, t. 32.

Two adult males from Hami. "Iris orange-red."

From Qonfudah, in the Berlin Museum, by Hempr. & Ehrenb.

#### 10. GALERIDA CRISTATA (L.).

*Galerida cristata*, Heugl. Orn. N.O.-Afr. p. 680; Hartl. & Finsch, Ostaf. p. 460.

One specimen. Shugra.

Well known from the Gulf of Aden.

#### 11. ARDEA BREVIPES, Hempr. & Ehrenb.

*Ardea brevipes*, Hempr. & Ehrenb. Symb. Phys. Av. fol. M; Heugl. Orn. N.O.-Afr. p. 1082.

An adult male from Bolhaf.

It remains doubtful to me whether this bird is really to be considered distinct from *A. atricapilla*, or merely a local variety of this species, confined, as Heuglin maintains, to the coasts of the Red Sea and the Gulf of Aden.

#### 12. LARUS LEUCOPHTHALMOS, Licht.

*Larus leucophthalmos*, Heugl. loc. cit. p. 1396; Finsch & Hartl. Ostaf. p. 821.

Two specimens, an adult and a younger male, from Hami.

"Iris grey; beak of a uniform greyish black."

6. Observations on the Incubation of the Indian Python (*Python molurus*), with special regard to the alleged Increase of Temperature during that process. By W. A. FORBES, B.A., Prosector to the Society.

[Received September 27, 1881.]

The first exact observations of the incubation of their eggs by the females of the constricting Serpents included in the genus *Python* were made, forty years ago, by M. Valenciennes in the Jardin des Plantes at Paris, his account having been published in the 13th volume of the 'Comptes Rendus' for 1841<sup>1</sup>. In this case the species observed was *Python bivittatus*: a female, about 10 feet long, which had been in company with a male of the same species of rather smaller size, and with which she had been seen several times in copulâ, laid at the beginning of May fifteen eggs, round which she coiled herself up, and so remained for fifty-six days, when eight of the eggs hatched, producing young snakes about half a metre in length. During the period of incubation Valenciennes observed a marked increase of temperature in the female, highest at the commencement of incubation and gradually diminishing thence till its close. His observations on the temperature are recorded in a table appended to the memoir already cited; and to them I shall have further occasion to refer in the sequel.

In the year 1862, a large female *Python sebae* laid a number of eggs, and also incubated on them, in this Society's Gardens, as described by Mr. Sclater at length<sup>2</sup>. The period of incubation lasted 82 days; at the end of that time the eggs were removed, as none had hatched, and they were evidently decomposing. On examination five or six were found with embryos inside, one of these being eleven inches in length. A few observations on the temperature of the female were taken, that of the male in the same compartment being taken at the same time. In every case, the female was found to be several degrees warmer than the male, the difference ranging between 2°·8 F. and 12°·4 F. when the surface temperature was recorded, and between 6°·8 F. and 20°·0 F. when that between the folds of the animals was measured.

During the past summer we have again had an opportunity of observing the incubation of a Python in the Society's Gardens. A female *Python molurus*, about 12 feet long, which had been living in company with two somewhat smaller males (one of this species, the other being a *Python bivittatus*), deposited during the night of June 5th-6th a number of eggs, about twenty. Round these she coiled herself up, in the same way as already observed by Valenciennes and Mr. Sclater, the eggs being nearly entirely concealed from view by her folds. In this position she remained for six weeks, without once eating, and with only one break in her

<sup>1</sup> *Tom. cit.* pp. 126-133.

<sup>2</sup> P. Z. S. 1862, pp. 365-368.



incubation, in the early part of July, when she left her eggs for a few hours, returning to them again however and coiling herself up as before, though now the regularity of her folds was not so great as it had been previously. On July 18th (that is, after a period of forty-three days from the date of laying), as the eggs were evidently decomposing, they were removed; and their state on examination was found to be very similar to that observed by Mr. Sclater on the previous occasion. Several of those examined showed no traces of having been impregnated; at least, no signs of any development inside remained; one or two, however, contained embryos, one of which was about 11 inches long, and had its scales well developed.

From the discrepancies existing between the observations of Valenciennes and those made here previously on the temperature of the incubating Pythoness, it seemed highly desirable to utilize the opportunity afforded by this last instance for a further and more extensive series of observations on the phenomenon in question. Mr. Zambra, of the well-known firm of Negretti and Zambra, who had himself taken part in the observations made in 1862, was kind enough to give me his most valuable aid and assistance in this investigation. He not only supplied us with excellent self-registering thermometers of the newest pattern and most delicate make, but was also kind enough to attend regularly—often, I fear, at considerable inconvenience to himself—to superintend and take the necessary readings. With the assistance of Mr. Bartlett, Mr. Clarence Bartlett, and the keeper of the reptiles, J. Tyrrell, Mr. Zambra and I were thus enabled to take a very considerable number of observations on the point in question, with instruments of a more accurate kind than had been available for our predecessors. Our first observations were taken on June 14th, about nine days after the eggs were laid; and they were continued thence without intermission, at intervals of two or three days, till the eggs were removed on July 18th. The readings were always taken about the same time of day, from 12 to 2 o'clock, in order to avoid any differences that might be due to the diurnal variation of temperature. Following Mr. Sclater's example, we took a double series of observations, one set on the incubating female, another on the male of the same species, which, after it had been removed from the female when the eggs were laid, was kept in the cage next to that of the female under conditions practically identical. The temperature of the Snakes was ascertained, first by placing the thermometer on the surface of their bodies, and then by placing it between the folds of their coils. In each case their bodies were covered by the blankets under which they usually rest; and, as far as possible, the different readings, of which we usually took three in each set, were obtained in as many different places in the coils, one towards the centre, the others more towards the outside. The temperature of the air was taken by suspending a thermometer a little way above the floor of the cages; that of the gravel in the cages by burying the bulb of the thermometer in the gravel, in the same position in each cage, and over the hot-water pipes which run beneath the floors of the cages.

The observations are given *in extenso*, as we took them, in Table I. (p. 964). In Table II. (p. 967) I have given the average temperatures of the two Snakes, as deduced from these observations, as well as the difference for each set of readings in the temperature in the two sexes. In the diagrams (figs. 1 and 2, p. 963) I have recorded these averages in a graphic form, the upper line marking the average temperature *between* the folds and the middle line the average *on* the folds, whilst the lowest one indicates the temperature of the air in the respective cages. This last curve is nearly identical in the two cases, that in the male's cage averaging, however, a trifle higher. Although this is the case, it will nevertheless be observed that *both* the temperature-curves of the female are higher than the corresponding ones for the male, especially the upper one. All four are clearly influenced by the variations in the external medium, the maxima temperatures of the snakes' bodies being attained when the air is hottest or nearly so.

Not only are the temperature-curves of the female higher, but, as shown by their less amount of angularity, the temperature of the female continues more constant throughout the time observed. This, no doubt, may in part be due to the fact of the female being in a condition of repose throughout, with no variations produced by exercise, the assimilation of food, or other causes.

Taking the averages of the first four columns of Table II., we get respectively  $82^{\circ}98$  F. and  $86^{\circ}03$  F. as the temperature of the male, and  $84^{\circ}38$  F. and  $89^{\circ}07$  F. as that of the female, according to whether the temperature is taken on the surface or between the folds. These figures give a difference of  $1^{\circ}4$  F. and a little over  $3^{\circ}0$  F., the difference being in each case in favour of the female.

The *maxima* readings obtained were, as may be seen from Table I.,  $89^{\circ}6$  F. (July 4) and  $89^{\circ}8$  (July 15) for the male (surface and folds), and  $89^{\circ}8$  F. (July 15) and  $92^{\circ}8$  F. (July 1) for the female. The maximum observed by Valenciennes was  $41^{\circ}5$  C. ( $106^{\circ}7$  F.), or nearly  $14^{\circ}$  higher than the highest I observed.

The greatest difference between the temperature of the air and that of the surface of the two Snakes was  $8^{\circ}3$  F. (on June 16th) in the case of the male, and  $9^{\circ}6$  F. (on June 18th) in the case of the female. The greatest differences between the air and the coils were also observed on the same days, and amounted to  $11^{\circ}6$  F. in the case of the male,  $16^{\circ}7$  F. in the female. Valenciennes found on one occasion the difference, as measured between the coils, as much as  $21^{\circ}5$  C. (between  $18^{\circ}0$  C. and  $39^{\circ}5$  C.) or  $38^{\circ}7$  F., a difference enormously greater than any we observed.

It would seem therefore that, if his observations are to be relied on, throughout the case recorded by Valenciennes the female developed a far greater amount of heat than ours did, though she was kept in a cage that was apparently considerably colder<sup>1</sup>. As in this

<sup>1</sup> The extreme temperatures of the air recorded by Valenciennes—who took his observations when the cages were coldest, *i. e.* before the fresh hot water was put in—are  $17^{\circ}$  C. and  $23^{\circ}$  C. ( $62^{\circ}6$  F. and  $73^{\circ}4$  F.) respectively. The temperature of the two cages in which our animals were kept was only on three occasions less than the highest in Valenciennes' series.

Fig. 1.  
Male.

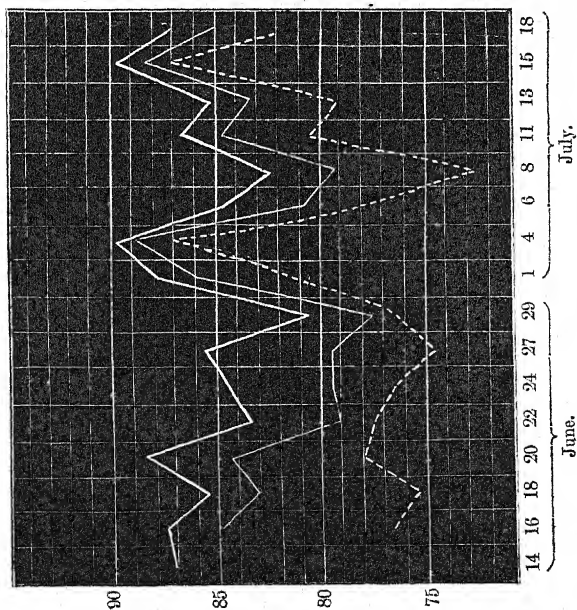


Fig. 2.  
Female.

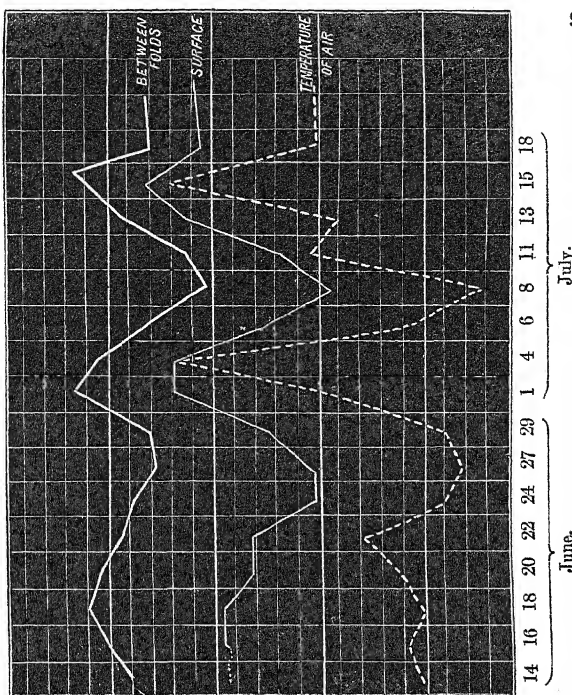


Diagram showing the temperature-curves of the male (fig. 1) and female (fig. 2) (incubating) Pythons. The top line indicates the temperature of the Snakes' bodies between their folds, the middle line that on the surface, the lowest line that of the air of the cages in which they were.

case more than half the eggs hatched out, it may be that the failure of our animal to do the same was due to the lack of heat. There is also in our case none of that steady fall in temperature, from the commencement to the close of incubation, observed by Valenciennes. In his case, at the commencement of incubation the female had a temperature of  $41^{\circ}5$  C. ( $106^{\circ}7$  F.) between the folds (the highest observed at all), falling at the end to  $28^{\circ}$  C. ( $82^{\circ}4$  F.). In our case, the maximum temperature was very nearly obtained on three different occasions.

The second set of observations, those made here in 1862, are hardly complete enough to allow of much comparison; but throughout that series the differences between the sexes are greater, though the absolute temperatures are considerably lower<sup>1</sup> than the average ones I obtained.

Renewed observations will be required to satisfactorily settle the amount of the increase of temperature—a fact of which there can now, I think, be no doubt—which is produced in these reptiles by the process of incubation. The average difference of  $3^{\circ}$  F. which I have obtained is, it may be observed, very nearly identical with that which occurs in the case of the temperature of fever-patients as compared with the normal. And as the increase of heat in an incubating bird is essentially of the same nature as that produced by an inflammation of a tissue, and such is also presumably the case in an incubating reptile, the nearness of the results thus arrived at is, in itself, an argument in favour of the correctness of my observations.

TABLE I.

*Record of Observations on the Temperature of the incubating (Female) and non-incubating (Male) Pythons.*

Date.	Air in cage.	Air under blanket.	Gravel of cage.	Male on folds.	Male between folds.	Female on folds.	Female between folds.	Remarks.
June 14...	° 83	°	°	84.8	86.9 86.7 87.6	°	89.5 88.5 88.9 88.7	
	75.0	77.2	82.5					

<sup>1</sup> Except in the case of one reading of  $96^{\circ}$  F., taken on the female, which was on that day  $20^{\circ}$  F. warmer than the male. This observation, however, is, I think, open to doubt.

TABLE I. (*continued*).

Date.	Air in cage.	Air under blanket.	Gravel of cage.	Male on folds.	Male between folds.	Female on folds.	Female between folds.	Remarks.
June 16...	♂ 76.6 ♀ 75.7	°  78.7	°  83.3	86.7 83.5 84.6	88.1 87.1 87.5 86.7	83.6 86.9 83.3	90.3 88.8 90.3	An observation taken on the tail of the male gave 82°·3. Two on another male on the tree in cage gave 76°·7 (each time).
" 18...	♂ 75.5 ♀ 75.0	79.6  81.3	84.5  83.8	82.6 83.5 83.6	86.3 83.8 86.5	84.4 85.4* 84.0	91.3 90.0 91.7	The male had fed the previous night, * Tail.
" 20...	♂ 78.0 ♀ 76.2	77.2  76.4	86.3  83.5	84.0 84.5 84.5	87.9 88.0 89.6 88.4 88.4	85.0 82.9 82.7	88.6* 92.7† 91.3 92.0 87.2	* The blanket over here was wet. † Tail.
" 22...	♂ 77.4 ♀ 77.8	79.1  82.3	84.7  84.0	77.3 79.8 80.1 78.6	84.5 82.8 83.8	80.9 83.4 85.9	88.9 89.7 89.9	The temperature of an egg, on the exposed surface, was 88°·3 (two observations).
" 24...	♂ 76.3 ♀ 74.4	73.7  73.9	83.5  79.5	79.2 78.6 80.7	84.4 84.4 84.3	78.3 80.6 81.8	88.7 89.3 88.0	Temperature of an egg 88°·1.
" 27...	♂ 74.6 ♀ 73.4	75.4  76.2	83.8  82.0	81.0 77.7 79.4	85.6 84.4 86.6	82.4 81.2 77.6	87.9 88.6 88.0 87.2	
" 29...	♂ 76.6 ♀ 74.0	79.8  78.2	83.0  82.2	78.6 76.9 77.0 77.7	79.3 80.4 82.2	83.0 83.6 81.0 82.8	88.0 89.0 87.5	

TABLE I. (*continued*).

Date.	Air in cage.	Air under blanket.	Gravel of cage.	Male on folds.	Male between folds.	Female on folds.	Female between folds.	Remarks.
July 1...	♂ 80·8	° 81·5	° 85·4	♂ 87·0 85·2	♂ 88·0 85·5	♂ 88·4 85·8	♀ 90·8 91·5	
	♀ 79·5	80·0	86·2	87·0 84·6	89·6 88·4	87·6 85·8	92·8 90·8	
" 4...	♂ 87·0	86·6	90·6	88·2 88·6	89·2 89·6	86·2 85·6	90·0 90·0	
	♀ 86·6	82·4	89·0	89·6	89·8 91·1	88·8	90·8 90·8	
" 6...	♂ 78·8	82·6	89·2	81·4 81·0	82·6 87·0	80·2 83·7	90·0 90·0	
	♀ 76·2	81·5	87·2	80·4	84·0 85·0	85·2 81·5	83·8† 88·7	† On neck.
" 8...	♂ 72·8	77·2	84·0	79·8 79·3	83·0 83·2	78·6 79·6	85·0 86·2	
	♀ 72·3	76·2	82·0	79·0	80·4 83·4	79·4	85·4	
" 11...	... ♂ 80·3	... 83·0	... 85·2	84·3 84·4 85·6	86·6 85·8 86·8 86·6	80·8 81·7 83·3	86·8 85·5 87·1	Two observations on a male that had been in the water gave 80°·4 and 79°·8, between the folds.
	♀ 80·2	79·0 80·3	84·8					
" 13...	♂ 79·3	80·7	85·1	83·4 83·3 84·3	85·5 85·9 85·1	85·4 86·2 87·1	88·7 89·6 89·0 89·7	The eggs are all exposed.
	♀ 79·2	83·3	83·8					‡ A male that had been in the water gave 82°·1 between the folds.
" 15...	♂ 87·1	87·7	90·3‡	87·7 88·7 88·6	89·8§	86·8 87·8 89·8	90·9 91·2 92·2 91·7	§ Only one observation, the male being very restless. A Boa (♂) in the same cage gave also 89°·8 as its temperature between the folds.
" 18...	♂ 82·2	86·0	89·2	85·1 84·5 85·4	88·0 87·4 86·2	86·2 85·7 84·3	88·0 86·6 88·8	
	♀ 80·0	82·8	86·8					

TABLE II.

Showing the Averages of the Observations recorded in Table I., and the Differences in Temperature between the two sexes.

Date.	Male.		Female.		Difference.	
	On surface.	Between folds.	On surface.	Between folds.	On surface.	Between folds.
June 14.....	°	87.1	°	88.9	°	1.8
„ 16.....	84.9	87.4	84.6	90.0	.3	2.6
„ 18.....	83.2	85.5	84.6	91.0	1.4	5.5
„ 20.....	84.3	88.5	83.5	90.4	.8	1.9
„ 22.....	79.0	83.7	83.4	89.5	4.4	5.8
„ 24.....	79.5	84.4	80.2	88.7	.7	4.3
„ 27.....	79.4	85.5	80.4	87.9	1.0	2.4
„ 29.....	77.6	80.6	82.6	88.2	5.0	7.6
July 1.....	86.0	87.9	86.9	91.5	.9	3.6
„ 4.....	88.8	89.9	86.9	90.4	1.9	.5
„ 6.....	80.9	84.7	82.7	88.1	1.8	3.4
„ 8.....	79.4	82.5	79.2	85.5	.2	3.0
„ 11.....	84.8	86.5	81.9	86.5	2.9	
„ 13.....	83.7	85.5	86.2	89.3	2.5	3.8
„ 15.....	88.3	89.8	88.2	91.5	.1	1.7
„ 18.....	85.0	87.1	85.4	87.8	.4	.7
Average.....	82.98	86.03	84.38	89.07		

N.B. The figures in black type point out when the difference of temperature is in favour of the male. Such cases, it is to be observed, only occur when the surface-temperature is observed.

December 13, 1881.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions made to the Society's Menagerie during the month of November 1881:—

The total number of registered additions to the Society's Menagerie during the month of November was 136, of which 46 were by birth, 36 by presentation, 33 by purchase, 15 were received on deposit, and 6 in exchange. The total number of departures during the same period, by death and removals, was 101.

The most remarkable additions during the month of November were as follows:—

1. Forty-six young Nose-horned Vipers (*Vipera nasicornis*), procured alive by a large female of this Serpent acquired on the 1st of

October last. But few of them long survived their birth; but the large number of young produced on one occasion by this venomous Snake is remarkable, and worthy of record.

2. A Vinaceous Amazon (*Chrysotis vinacea*), purchased November 30, being of a species new to the Society's collection.

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Mr. Selater exhibited two skins of a Rail obtained from Macquarie Island, south of New Zealand, and transmitted to him by Sir George Grey, K.C.B., F.Z.S. The skins were in bad condition and hardly suitable for exact determination, but appeared to belong to the species lately described by Captain Hutton as *Rallus macquariensis* (Ibis, 1879, p. 454).

Mr. Selater proposed to deposit these specimens in the British Museum.

Mr. Henry Seebohm, F.Z.S., exhibited a specimen of the Rusty Grackle (*Scolecophagus ferrugineus*), which had been shot on the 4th of October last, by a workman engaged as a wheelwright, within a mile of Cardiff, on the grassy flats between the sea and the mountains which are known there as "moors." It had been brought a few hours after being killed to Mr. Robert Drane, F.L.S., by the man who shot it, and who was in the habit of bringing to that gentleman any rare bird that he happened to meet with. It had been shot on the wing; and the plumage was in such a perfect condition, that the idea of its having escaped from a cage seemed untenable. Mr. Drane had known the man some time as an intelligent though uninformed workman, fond of birds, and believed perfectly in his bona fides. This bird had never before been recorded as a British one. It was said to breed in the arctic regions of the American continent up to the limit of forest-growth from Labrador to Alaska. The example obtained at Cardiff appeared to be an adult male in autumn plumage.

Mr. Seebohm also exhibited a specimen of Pallas's Great Grey Shrike (*Lanius major*), which had been shot in the April of the present year, by a gamekeeper, twenty miles west of Cardiff, and sent in the flesh to a bird-preserver in that town, who had shown it to Mr. Drane before skinning it, and in whose possession it had remained. This species was known to breed from North Scandinavia eastwards throughout Siberia, but had not been recorded before from the British Islands.

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The following papers were read:—



## 1. On the Whale-Fishery of the Basque Provinces of Spain.

By CLEMENTS R. MARKHAM, F.R.S. (Communicated  
by Professor FLOWER.)

[Received November 14, 1881.]

My attention was originally drawn to the Basque Whale-Fishery by observing, during my study of Arctic literature, and especially while editing the voyages of William Baffin, that the first English whaling vessels were in the habit of shipping a boat's crew of Basques to harpoon the whales. I was informed that a whale, the *Balæna biscayensis*, had frequented the coasts of the Basque provinces from time immemorial; but that it had become nearly extinct in the 17th century, when the Basques began to extend their voyages further north and across the Arctic Circle. Hence the Basques had become dexterous whale-fishers long before any other European people had entered upon that perilous occupation.

I found that several naturalists had investigated the history of the Biscayan whale, notably Eschricht and Reinhardt in Denmark, M. Fischer in France, and Professor Flower in this country. Full information respecting these investigations is contained in Eschricht and Reinhardt's memoir published by the Ray Society in 1866; and many interesting particulars have since been brought to light respecting the whale-fishery so far as it relates to the French Basques, and to the ports of Bayonne, Biarritz, Guéthary, St Jean de Luz, and Ciboure.

But in looking through the books and papers on the subject, a list of which was kindly furnished to me by Professor Flower last June, I did not find any particulars respecting the Spanish ports, where the Basque sailors are more numerous than in France, and inhabit a more extensive line of coast. I therefore thought it possible that, by visiting those ports and making inquiries respecting the literature of the provinces in which they are situated, and the local traditions, I might be able to collect some further information touching the whale-fishery of the Basques. It has now been suggested to me that such particulars as I have succeeded in bringing together, from their bearing on the history of the *Balæna biscayensis*, a nearly extinct animal, would be interesting to the Zoological Society. I therefore have pleasure in communicating the following notes on the subject.

The coast which I personally visited this summer extends from the French frontier to the Cabo de Peñas, including the Basque provinces of Guipuzcoa and Vizcaya, and the purely Spanish provinces of Santander and the Asturias. It is for the most part bold and rocky, with lofty cliffs of cretaceous limestone, having strata hove up at great angles. Occasionally there is a stretch of sand, generally at the mouths of rivers, and here and there a rocky little boat-harbour. Forests of oak and chestnut clothe the mountains, with occasionally open spaces of fern and heather and bushes of arbutus and myrtle.

In some places the chestnut-groves come down almost to the water's edge.

Along this coast there are many small fishing-towns. Fuenterrabia, on its picturesque hill, overlooks the French frontier. Following the coast to the westward the next port is Pasajés; and then comes the city of San Sebastian, which was the centre of the old whale-fishery. Zarauz is a town stretching along the shores of a sandy bay. Guetaria is built in a cleft of rocks which are sheltered behind the island of San Anton. Zumaya and Deva are at the mouths of rivers; and Motrico is a picturesque little town built on steep slopes like Clovelly, overlooking a rocky bay. These are the ports of Guipuzcoa.

Ondarroa, at the mouth of its river, where small schooners are still built, is the first port of Vizcaya, coming from the east. Lequeitio is a large and more important place, sending out about a hundred fishing-boats. Next come Mundaca, at the mouth of the river Guernica, Bermeo, another populous fishing-town with as many boats as Lequeitio, Plencia, and Portugalete and Santurce in the bay of Bilbao. These are the principal Vizcayan ports.

The province of Santander has Castro-Urdiales, Laredo and Santoña on the shores of a large harbour, Santander itself, and San Vicente de la Barquera.

In the Asturias are the ancient ports of Llanes, Rivadesella, Villaviciosa, the important town of Gijon, Candas, and Luanco. From the little village of Luanco to the end of the Cabo de las Peñas is a walk of eight miles; and this was the most western point I reached.

The Basque fishermen are a handsome race. They go away on their fishing-voyages for many days, and are brave, honest, and industrious; while both men and women are always cheerful and light-hearted. They belong to a people who, for centuries, have repelled foreign invasion, have enjoyed free institutions, and made their own laws. The Basque fishermen are the descendants of the old whalers, and retain their traditions. They have, from time to time, produced naval worthies whose names are historical. Among them are Sebastian del Cano, a native of the little fishing-town of Guetaria, who was the first circumnavigator of the globe; Legaspi, the conqueror of the Philippine Islands; Machin de Munguia, the Spanish Grenville; and Churrueta, whose gallantry at the battle of Trafalgar won for him the admiration of his English foes.

Such men were the product of the whale-fishery, which was for the Basques, as it has since been for the British, an admirable nursery for seamen.

My first inquiries had reference to the antiquity of the Basque whale-fishery. The following facts show that it was a well established trade in the 12th century; so that it probably existed at least two centuries earlier. King Sancho (the Wise) of Navarre granted privileges to the city of San Sebastian in the year 1150. In this grant there is a list of articles of merchandise, with the duties that must be paid for warehousing them; and whalebone has a prominent

place in the list : "*Carga de boquinas-barbas de ballenas . . . . . 2 dineros.*" The same privileges were extended by Alfonso VIII. of Castille to Fuenterrabia in 1203, and to Motrico and Guetaria in 1204. Ferdinand III., in a royal order dated at Burgos the 28th September 1237, gave similar privileges to Zarauz. And this document contains further proof of the antiquity of the whale-fishery ; for a claim is made that, in accordance with custom ("sicut forum est"), the King should have a slice of each whale, along the backbone, from the head to the tail. The custom here referred to indicates the antiquity of the fishery. At Guetaria it was the custom to give the first fish of the season to the King, who usually returned half.

Another proof of the importance of the whale-fishery on the northern coast of Spain, and probably also of its antiquity, is the fact that no less than six of the towns have a whale for their coat of arms. This charge is in the arms of Fuenterrabia. Over the portal of the first house in the steep old street of Guetaria there is a shield of arms consisting of a whale amidst waves of the sea. At Motrico the town arms consist of a whale in the sea, harpooned, and a boat with men holding the line. The same device is carved on the wall of the Town Hall of Lequeitio. The arms of Bermeo and Castro-Urdiales also contain a whale.

I was assured that *vigias* or look-out posts were established on the headlands, and high up the mountains overlooking the fishing-towns, whence notice was given directly a whale was seen spouting in the offing ; and soon the boats were in pursuit. On the mountain of Talaya-mendi ("Look-out mountain") above Zarauz, there are some ruined walls, which, according to Madoz, are the remains of one of these watch-towers, whence warnings were sent down the moment a whale was in sight.

In some of the towns there are records which throw light on the whale-fishery ; but (chiefly during the French occupation) most of the ancient archives have been destroyed or are lost. Fortunately this is not universally the case. In the town of Lequeitio eight of the "*libros de fabrica*" or fabric rolls of the church, commencing from the year 1510, have been preserved, which contain much interesting information.

The most ancient document relating to whales in the Lequeitio archives is dated September 11th, 1381. It is there ordered and agreed by the *Cabildo* that the whalebone taken shall be divided into three parts, two for repairing the boat-harbour, and the third for the fabric of the church. The same order is repeated in another document dated 1608.

In the "*libros de fabrica de la iglesia de Lequeitio*" there is a list of the whales killed, in various years, by the boats of Lequeitio, from 1517 to 1661.

1517. Two whales killed.

1525. Returns in money value.

1531. January and February, two large and one small whale killed.

1532. None killed.

- 1536. Two large whales and one small.
- 1538. Six whales killed.
- 1542. Two whales killed.
- 1543. One whale wounded by the Lequeitio people, but captured at Motrico.  
Divided between the two towns.
- 1543. Two whales killed, mother and young. The Mayor-domo working all day at the whalebone, and received 2 rials.
- 1546. February 24 a whale killed in front of St. Nicholas Island. The bones yielded 9½ ducados.
- 1550. Two whales killed.
- 1570. One whale killed.
- 1576. One whale killed.
- 1578. One whale killed.
- 1580. Three and a young one.
- 1608. One whale killed.
- 1609. Three whales killed.
- 1611. Two small whales killed, in concert with the men of Andarroa, which led to a law suit.
- 1617. One whale killed.
- 1618. One whale killed.
- 1619. One whale killed.
- 1622. One whale killed with its young.
- 1649. Two whales killed.
- 1650. Two whales killed.
- 1657. Two whales killed and two young.
- 1661. One whale killed.

In the "*libro de fabrica*" including the years from 1731 to 1781 there is no mention of a whale, nor in the two succeeding books. The sailors went long voyages in search of them. But in 1712, fifty years after the last entry in the books, there were boats and apparatus for catching whales. In 1740 it was said that there were no sailors in Lequeitio, all having gone on long whaling voyages. In a record of a marriage at Lequeitio on July 15th, 1712, among the goods of the bride are mentioned a whale-boat with sails, lines, harpoons, and apparatus complete. Of the bridegroom it is said that "he was clothed decently, having four coats of London cloth, a good chest to keep his clothes in and another for travelling, a mattress, pillow, and blanket, and needful clothes for going to sea." So that between them they were well prepared for a whaling expedition.

These entries at Lequeitio indicate that during the sixteenth century the whales were abundant; for if this was the catch of only one village out of at least twenty along the coast, we may fairly multiply it by at least ten for the average yield of the fishery.

In the books of the "*Cofradia de Marchantes*" of Zarauz there are similar records, from which it appears that between the years 1637 and 1801 as many as 55 whales were killed by the Zarauz people, whose prowess was known throughout the Cantabrian coast. There is one noteworthy tradition at Zarauz, to the effect that two young sailors, without any help, chased, harpooned, and killed a large whale, and brought it safely to the beach. This deed is immortalized on imperishable stone. Over the portal of a house in Zarauz, no. 13 Calle de Azara, there is an inscription, now in the greater part rendered illegible by time, but with letters of the shape and style used in the

sixteenth century. To the left of the inscription there is carved a harpooned whale, with the line fastened to a boat, in which are two men. Don Nicolas de Soraluece, the learned historian of Guipuzcoa, told me that an old resident in Zaranz, named Belaunzarán, had often spoken to him of the feat recorded on this stone slab, adding that he used to hear his grandmother explain that the carving represented the harpooning and killing of a whale by two young sailors in a single boat. This deed was considered worthy of being handed down to posterity; and the stone was therefore placed over the door of the house of these two brothers, or, as some say, a father and son.

There are some other records as to the disposition of the whalebone. By an order dated Nov. 20th, 1474, the town of Guetaria gave half the value of each whale towards the repair of the church and of the boat-harbour. In San Sebastian, according to an ancient custom, the whalebone was given to the "*Cofradia*" (brotherhood) "of San Pedro."

It is clear that the whales, close along the coast, became very scarce in the middle of the seventeenth century, when the entries at Lequeitio cease, and that the Basque sailors then began to seek the means of exercising their special craft by making long voyages, even to the Arctic regions. Such voyages were occasionally made at a still earlier period. It is stated by Madoz that a pilot of Zarauz named Matias de Echeveste was the first Spaniard who visited the banks of Newfoundland, and that, according to a memoir written by his son, he made 28 voyages from 1545 to 1599, the year of his death. In the accounts of the first English whaling voyages to Spitzbergen, in the collection of Purchas, we read of Basque ships from San Sebastian frequenting those Arctic seas in search of whales, and of the overbearing way in which their captains were often treated by the English. Nevertheless the English were glad to obtain the help of the Basque sailors to do for them the most perilous and difficult part of the work, namely the harpooning and killing of the whales.

I gather from Eschricht and Reinhardt's memoir that this Biscayan whale was known to the French Basques as the "*Sarde*," and was the same as the "*Nordkaper*" of the Dutch and North Germans, and the "*Sletbag*" of Iceland, a whalebone whale, but smaller and more active than the great Greenland Whale. The *Konge-speil* (an ancient Norwegian record) has a passage to the effect that "those who travel on the sea fear it much; for its nature is to play much with vessels." Belonging to the temperate North Atlantic, it is described as much more active than the Greenland Whale, much quicker and more violent in its movements, more difficult and dangerous to catch. It is smaller and has less blubber than the *B. mysticetus*, the head shorter, and the whalebone much thicker but scarcely more than half as long.

For centuries the Basques had attacked and captured this formidable Cetacean; and they, in fact, monopolized all the experience and skill which then existed in connexion with the craft and mys-

tery of whale-fishing. To the sailors of all other nations it was an unknown business, appearing all the more perilous from their lack of knowledge. So it was natural that the hardy and intrepid fishermen from the Cantabrian coast should be in requisition as harpooners as soon as the English and Dutch entered upon the Arctic whale-fishery, early in the seventeenth century. Along with their services, we also borrowed their words. Harpoon is derived from the Basque word *Arpoi*, the root being *ar*, "to take quickly." The Basque *Harpoinari* is a "harponeer."

There is a letter still extant at Alcala de Henares, from James I. of England to the king of Spain, dated 1612, in which permission is asked to engage the services, on board English vessels engaged in the Arctic whaling-trade, of Basque sailors skilled in the use of the harpoon. The fact that Basque boats' crews were frequently shipped seems to show that this request was granted. In the whaling fleet fitted out for Spitzbergen in 1613, under the command of Benjamin Joseph, with Baffin on board the general's ship as pilot, 24 Basques were shipped. Orders were given that "they were to be used very kindly and friendly, being strangers and leaving their own country to do us service." The English seem to have adopted the fishing-rules of the Basques, as well as to have benefited by their skill and prowess. Thus we read of an order being given because "the order of the Biscaines is that whoso doth strike the first harping-iron into him, it is his whale, if his iron hold." The Basques went out to attack the whales in the offing, while the English got ready for boiling-down. We read:—"News was brought to us this morning that the Basks had killed a whale; therefore we hasted to set up our furnaces and coppers, and presently began work; which we continued, without any want of whales, till our voyage was made"—thanks to the Basques. In another place Baffin calls the Basques "our whale strikers."

Of course the English, in due time, learnt to strike the whales themselves; but the Basques were their instructors; and it is therefore to this noble race that we owe the foundation of our whaling trade.

In travelling along the coast, I found a universal tradition of the whale-fishery; and often the families of fishermen had the harpoons hanging in their houses, which had been there for generations. They still have occasion to use them when porpoises come within range; and on board one of the Gijon steamers there was a man with unerring aim. But many harpoons hang on the walls as relics of the old whaling days. At Laredo the fishermen brought me a harpoon of peculiar construction. The point was narrow and very slightly barbed; but there was a hinge halfway up the point, which was kept in line with the shaft by a ring. When the harpoon entered a whale, the ring slipped, the hinge turned, and the point came at right angles to the shaft, making it impossible for the harpoon to come out again. Baron Nordenskiöld informs me that this kind of harpoon is used by the Norwegians to kill the white whales.

At Llanes, in Asturias, I found a large palatial house which was

formerly the "*Casa de Ballenas*," or house where business connected with the whale-fishery was transacted. At Gijon there is also a "*Casa de Ballenas*," and a street called Whale-lane. These names, with the coats of arms and traditions, are all relics of the old whaling days. At San Sebastian, too, there are enormous *tinjas*, or earthenware jars, in which the oil was stored.

It was at one time supposed that the *Balæna biscayensis* had become quite extinct; but this is certainly not the case. Whales are seen on the Cantabrian coast at intervals of about ten years. In 1844 a whale was seen off Zarauz. Boats went out, and it was hit; but it broke the lines, and got away with two harpoons and three lances in its body, after having towed the boats for six hours. On the 25th of July 1850, early in the morning, a whale appeared off Guetaria. Boats quickly pursued it; but the harpioneer missed his aim, and the whale went off, heading N.W. In January 1854 a whale and her two young entered the bay of San Sebastian. One of the young whales was singled out for attack; but the mother made desperate efforts to defend it, and once broke the line. Eventually the mother and one calf escaped, while the other was secured. Of course, with proper boats and apparatus, and if the fishermen had had a little of their ancestor's experience, all three would have been caught. It was the skeleton of this young whale that Professor Eschricht purchased at Pampluna. It is now at Copenhagen.

While I was at Gijon, in the Asturias, I was told by an old fisherman that a whale had been caught, about twenty years ago, by the villagers near the lighthouse on Punta de Peñas. The story was not believed by merchants and others of whom I made inquiries; so I thought it best to investigate the matter myself. I therefore went westward to the little fishing-village of Luanco, and next day proceeded on foot across a wild mountainous country to the lighthouse of Punta de Peñas—a distance of 16 miles there and back. There, in the courtyard of the lighthouse was a whale's jaw-bone; and the man in charge corroborated the story. But he added the curious statement that the whale was dead and half flensed, drifting in under the land, when the villagers first saw it and went out in their boats to tow it on shore. I also found parts of the rib-bones in the granary of a farm-house at Viodo, a hamlet near the lighthouse.

The last whale of which I obtained intelligence was sighted between Guetaria and Zarauz on the 11th of February 1878. Many boats went out from those two places, and one boat from Orio. The first harpoon that kept fast was thrown by a smart young sailor of Guetaria, the countryman of Sebastian del Cano, the first circumnavigator of the globe. He is now in the Spanish navy. Eventually the whale was killed and towed on shore. No one derived any benefit, because there was a law-suit tried at Azpeitia. It appears that the harpoon was of Guetaria, but that the line belonged to Zarauz. Meanwhile the whale became unpleasant and had to be blown up. The authorities of San Sebastian, however, through the intervention of Don Nicolas Soraluce, secured the bones; and the

skeleton is now carefully set up in the small museum in that city. It is 48 feet long; and part of the whalebone remains in the jaw. There are also bones of a whale found in the sands at Deva, in the same museum. I was given part of a whale's rib dug up on the Lequeitio beach; and a jawbone, which was long in the courtyard of the palace of the Marques de San Estevan at Gijon, is now preserved in the Jovellanos Institute of the same town. Of course there must be any number of bones buried in the sand of the beaches where so many hundreds of whales have been fensed in former centuries.

In 1878 the accomplished historian of Guipuzcoa, Don Nicolas Soraluce, printed a pamphlet at Vitoria on "the origin and history of the whale and cod fisheries," which contains much interesting information. I may add that Señor Soraluce is preparing some additional chapters on the whale-fishery, and that he expects to obtain copies of interesting documents relating to the same subject from the archives of the Ministry of Marine at Madrid.

2. On the Condition of the Median Portion of the Vaginal Apparatus in the Macropodidæ. By J. J. LISTER, B.A., F.Z.S., St. John's College, Cambridge, Demonstrator of Comparative Anatomy in the University of Cambridge, and J. J. FLETCHER, M.A. (Syd.), B.Sc. (Lond.).

[Received November 8, 1881.]

In the Marsupialia, as is now well known, the female reproductive organs consist of two ovaries, two oviducts, two uteri, two vaginae, a urogenital sinus, and a clitoris. The vaginae are variously complicated in the various families comprising the order; but in the Kangaroos the vaginal apparatus may be described in general terms as consisting of a median portion (formed by the union and more or less complete coalescence of the portions of the Müllerian ducts which succeed the uteri), and of the two lateral portions (which curve outward and backward somewhat like the handles of a vase, and open distally, but without making any projection, into the urogenital chamber). They are what are usually known as the two vaginae. The median portion is usually described as approaching the urogenital chamber more or less closely, but as ending blindly, thus forming a cul-de-sac, and as being connected with it simply by connective tissue.

A considerable number of observers have met with the median vaginal portion in a condition very different from that just described, inasmuch as its tissue was found to be continuous with that of the urogenital passage, and, what is still more interesting, the two chambers communicated with one another by an aperture situated immediately above that of the meatus urinarius.



Though several anatomists have met with uterine *foetuses in situ*, no one as yet seems to have had the good fortune to find an embryo in any part of the vaginae; consequently there has been much controversy as to the route taken by the embryo in passing to the urogenital passage. Some writers maintain that it comes down one of the lateral canals; while others affirm that these serve only for the conveyance of the semen, and that the embryo passes directly from the median vaginal canal into the urogenital chamber.

We have ventured to bring the subject under the notice of the Society for several reasons. First, because we have found the open condition in some species in which it has not hitherto been recorded; secondly, because the text-books used by students in this country either refer to the subject only very briefly, as in Prof. Owen's 'Comparative Anatomy,' vol. iii., or nor at all, as in the manuals of Profs. Gegenbauer, Huxley, and Macalister; thirdly, because, with the exception of Home and Owen, no English observers seem to have noticed the open condition of the median cul-de-sac, while it has, as we shall show presently, attracted the attention of a considerable number of continental investigators. As will be pointed out later on, many of the observations already recorded are almost valueless, because the observers have not referred their specimens to any genera or species, or because they have been unable or have neglected to offer any evidence as to whether the animals they are dealing with had certainly produced young or not.

Before giving the details in connection with our specimen, it will be interesting to state briefly the results already obtained. As far as we can learn, the observers who have investigated the condition of the median vaginal canal, and have published the results arrived at, are the following—Home, Cuvier, Seiler, G. St.-Hilaire, Owen, Carus, Vrolik, Poelman, Alix, Lucä, Pagenstecher, Garrod, and Brass.

Sir E. Home<sup>1</sup>, who published an account in 1785, seems to have been the first to give a description of the female reproductive organs of the Kangaroo. This writer says that impregnated uteri had reached John Hunter before his death, but that from want of leisure the illustrious anatomist was prevented from giving them the attention they deserved. Home does not say how many specimens came under his own observation, nor to what species they belonged. In one of his specimens he found the median vaginal portion (uterus of Home) a veritable cul-de-sac. In another specimen he found the median vaginal portion (uterus of Home) in communication, by a small aperture, with the urogenital chamber (vagina of Home). Finding what he took to be an embryo in the median vaginal canal (uterus of Home), he supposed that he was dealing in this case with an impregnated uterus, and in the previous case with one in the virgin condition; and he came to the conclusion that the median vaginal portion was impervious in the virgin state, that during pregnancy

<sup>1</sup> Phil. Trans. lxxxv. 1785, pp. 222-230; also Lect. on Comp. Anat. vol. iii. pp. 341-370.

an orifice large enough to admit a hog's bristle was to be met with, and that "immediately after parturition, the parts are nearly brought back into their original state; the only circumstance deserving note is, that the opening leading directly from the uterus (that is the median vaginal canal) to the vagina (urogenital sinus), which is not met with in the virgin state, after being enlarged by the passage of the fœtus, forms a projecting orifice and almost wholly conceals the meatus urinarius."

Concerning the views of Cuvier and of Geoffroy St.-Hilaire we are not able to say much. From allusions in several of the papers shortly to be mentioned, it would appear that Cuvier was opposed to the view that a direct communication existed between the median vaginal and the urogenital chambers, while G. St.-Hilaire was in favour of such a view. Owing to the want of satisfactory references, we have been unable not only to meet with the original papers in which these two distinguished authors enunciated their views, but also to find any descriptions of actual dissection. In the English edition of the '*Règne Animal*,' however, the following passage occurs:—"The matrix of the animals of this order (Marsupialia) does not open by a single orifice into the extremity of the vagina, but communicates with the canal by two bent lateral tubes."

In 1828 Seiler<sup>1</sup> published his observations on a "Kangaroo" which had a mammary fœtus in the pouch. He says:—"Noch immer findet man in mehreren neuern Schriften die alte Meinung wiederholt, es entstehe zur Zeit der ersten Geburt des Fœtus eine Oeffnung in dem Gebärmutterhalse, gleich hinter der Harnröhrenmündung, durch welche der Embryo geboren werde. So unwahrscheinlich mir auch immer diese Ansicht erschien, so sprechen doch Home's Beobachtungen dafür, und ich untersuchte daher nicht nur die Gebärmutter ganz genau, sondern füllte sie auch von einer Muttertrompete aus mit Quecksilber so stark an, dass sie ganz gespannt ausegedehnt wurde: allein es zeigte sich keine Spur einer Oeffnung, und es ist mir nun gar nicht mehr zweifelhaft, dass der Embryo durch die seitenkanäle der Gebärmutter geboren werde, deren Uebergangsbildung zu den Eyeröhrn Geoffroy St. Hilaire sehr richtig nachweist."

In 1834 Prof. Owen<sup>2</sup> published his paper "On the Generation of the Marsupial Animals, with a Description of the impregnated Uterus of the Kangaroo," from which we quote the following passage:—"The fœtus has been conjectured to pass into the urethro-sexual cavity by a direct aperture formed after impregnation at the lower blind end of the cul-de-sac; but I have not been able to discover any trace of such a foramen in two Kangaroos which had born young, and besides I find that this part of the vagina is not continuous by means of its proper tissue with the urethro-sexual canal, but is connected to it by cellular membrane only; and the structure is agreeable to what is presented in the simpler forms of the marsupial uterus, as in *Didelphys dorsigera* and the *Petauri*, in which the culs-de-sac do not even come

<sup>1</sup> Isis, 1828, pp. 475-477.

<sup>2</sup> Phil. Trans. cxxiv. 1834, pp. 333-364.

into contact with the urethro-sexual passage." Almost identically the same statement is repeated on page 316 of the same writer's article on "Marsupialia" in vol. iii. of Todd's 'Cyclopædia of Anatomy and Physiology' (1839-1847). On page 319 of the same article, moreover, the following words occur:—"I have already shown that one of the chief grounds of the theory of marsupial generation there proposed (that is Home *loc. cit.*) is untenable, the supposed remains of the fœtus, described as being situated in the corpus uteri (vaginal cul-de-sac) being nothing more than a portion of the inspissated secretion commonly present both in this sac and the lateral canals. *The temporary orifice by which the fœtus is stated to pass immediately from the so-called corpus uteri into the vagina (urogenital passage) does not exist.*"<sup>1</sup> We do not understand why Prof. Owen uses the term "temporary orifice." The passage of Home's already quoted seems to show that after parturition he regarded the orifice as being permanently established. Apart from this, however, it would seem that Prof. Owen did not accept either the conclusions or the facts of Home. As we shall point out further on, in 1868 Prof. Owen made the very important admission that in *II. bennetti* the aperture of communication between the median cul-de-sac and the urogenital canal is doubtless normal, at least, after parturition.

Carus in his Manual<sup>2</sup> (1834) speaks of having dissected a Kangaroo which had a young one about 8 inches long in the pouch. He found a means of communication between the two chambers. It is true that in this, as in other cases, the aperture was glued up, or plugged with mucus; but this is a matter which has nothing to do with the question whether the median vaginal portion is always and under all circumstances a blind sac, or whether during and after parturition there is not a possible means of communication between the median vaginal portion and the urogenital sinus.

In the same year Prof. Owen<sup>3</sup> published an account of the female organs of a specimen of *Macropus parryi*; and alluding to the mesial cul-de-sac of the vagina, the author says that it "did not extend quite so far down in *M. parryi* as it does in the better-known species." No allusion is made to the breeding of the animal; but its history is well known and has been recorded both by Bennett<sup>4</sup> and by Waterhouse<sup>5</sup>. If this female, whose history is so minutely recorded, had ever produced young, no doubt such an event would not have been passed over in silence. As it is we think it extremely probable that the animal died a virgin.

In Vrolik's paper<sup>6</sup>, "Ontleed en natuurkundige aantekeningen over den grooten Kangaroo (*M. major*)," published in 1836, the female organs are described and figured. With the aid of a friend we have been able to make out that he found the mesial cul-de-sac

<sup>1</sup> The *italics* are our own.

<sup>2</sup> Lehrbuch der vergl. Zoötomie, 2nd ed., 1834.

<sup>3</sup> P. Z. S. 1834, p. 152.

<sup>4</sup> Trans. Zool. Soc. vol. i. 1833-1835, pp. 295-300.

<sup>5</sup> Nat. Hist. of Mammalia, vol. i. pp. 113-114.

<sup>6</sup> Hoeven en Vriese, Tijdschr. iii. pp. 291-356.

closed; but we do not know if he had any evidence whether the animal had ever had young.

In 1851 Prof. Poelman<sup>1</sup>, of Gand, published an account of his observations on a female specimen of *Halmaturus bennetti*, in which he found "que la même partie (median vaginal canal) communique librement avec le vestibule genito-urinaire." Prof. Owen was the first who met with this condition in this species. We subjoin his account of his discovery, which was published in 1852<sup>2</sup>:—"In a specimen of *Macropus (Halmaturus) bennetti* which I dissected in 1845, I detected a natural aperture of communication between the median cul-de-sac and the urogenital canal. I had the pleasure of showing the specimen to Dr. Poelman during a recent visit of that eminent comparative anatomist to the Hunterian Museum, and of thus confirming the observation which he had, independently, made of a similar modification of the female generative organs in a specimen of the *M. bennetti* dissected by him at the University of Gand."

Prof. Owen, in his "Notes on the Anatomy of *Dendrolagus inustus*," published in 1852<sup>3</sup>, says:—"The lateral bent vaginal canals are shorter in proportion than in *M. major*; but the median vaginal cul-de-sac was closed, as in that species." This specimen was the first living representative of the species exhibited in Europe. It lived in the Society's Gardens for four years. Of its early history there is no record, as far as we know; but it was probably captured when young. If this rare animal had bred during its sojourn in the Menagerie, such an interesting event would naturally have been mentioned in Prof. Owen's paper. There is no allusion to any such event; and it would seem very probable that the female in question was a virgin.

In a paper published in 1857<sup>4</sup>, Vrolik described the anatomy of a female specimen of *Dendrolagus inustus*. From this we gather that he found the median canal closed.

In 1866 Alix<sup>5</sup> met with the open condition in a female of *Halmaturus bennetti*, and, being unaware of the papers of Owen and Poelman, published his discovery as a new one. To this Profs. Poelman<sup>6</sup> and Owen<sup>7</sup> promptly replied. From the former's reply we subjoin the following extract (p. 399):—"J'ajouterai que, depuis la publication de ce travail [that is, his paper already referred to] j'ai eu l'occasion de vérifier cette disposition anatomique [that is, the open condition] chez d'autres individus appartenant à la même espèce (*H. bennetti*), et en ce moment je ne conserve plus aucun doute sur son existence constante." From Prof. Owen's reply we quote as

<sup>1</sup> Bull. de l'Acad. Roy. de Belgique, xviii. 1851, p. 590.

<sup>2</sup> P. Z. S. 1852, p. 106.

<sup>3</sup> Ibid.

<sup>4</sup> W. Vrolik, "Ontleed kundige nasporingen omtrent *Dendrolagus inustus*," Verhandelingen der Koninklijke Akademie van Wetenschappen, &c. &c. Amsterdam, vol. v. of series iv., 1857.

<sup>5</sup> Compt. Rend. Paris, lxii. 1866, pp. 146-148.

<sup>6</sup> Ibid. pp. 399-400.

<sup>7</sup> Ibid. pp. 592-596.

follows:—"Dans le *Macropus*, les culs-de-sac vaginaux communiquent entre eux, et la cavité commune s'étend jusqu'au vestibule uréthro-génital, mais sans y déboucher. *C'est ce que j'ai constaté chez des femelles de l'espèce M. major, qui avaient fait les petits au moins deux fois.* Dans l'*Halmaturus*, le cul-de-sac non seulement atteint le fond du vestibule uréthro-génital, mais il y débouche, comme on l'a montré depuis longtemps."

In 1867 Prof. Lucä<sup>1</sup> published the result of his investigations made upon three females, two of which belonged to *H. bennetti*, and the third to *H. billardieri*. The latter and one of the former were adult; and in both cases Lucä found a direct communication between the median vaginal portion and the urogenital sinus. In the third specimen, which was a not full-grown female, he found the median vaginal cul-de-sac closed.

In 1868 Prof. Owen's Comp. Anat. vol. iii. was published, in which the only reference to the subject is as follows (p. 683):—"In *H. bennetti* I found an aperture of communication between the median cul-de-sac and the urogenital canal; and, as the same structure has been observed in two other specimens, it is doubtless normal, at least after parturition. The fact, however, does not justify the conclusion that the lateral vaginal canals convey exclusively the semen for impregnation, and that the median canals, *which, as a rule, are closed and distinct from each other, serve only to transmit the fœtus to the urogenital passage.*"

In 1869 Lucä<sup>2</sup> published an account of his examination of a second adult specimen of *H. bennetti*, which had a mammary fœtus 2-2½ inches long in the pouch. In this case also the median vaginal canal communicated with the urogenital sinus.

In 1871 Prof. Pagenstecher<sup>3</sup>, of Heidelberg, published an article "Ueber den Embryo von *M. major*." This observer found a fœtus in the left uterus; and he says:—"dass Owen ganz Recht hat, indem er sagt dass bei *M. major* überhaupt eine Kommunikation des mittleren Scheidenblindsacks mit dem von ihm als Vorhof bezeichneten Abschnitt nicht besteht, wogegen *H. ruficollis (bennetti)* die vollständig offene Verbindung zeigt."

In 1875, Prof. Garrod<sup>4</sup>, in speaking of *H. luctuosus (Dorcopsis luctuosa)* writes:—"The uterus is perfectly Macropine, as are the vaginæ. No direct communication could be found between the uterine pouch of the vaginæ and the common vaginal canal."

In a paper by Brass<sup>5</sup> published in 1880, examples of three genera of Macropodidæ are described and figured. In no instance is it stated whether young had been born or not. A specimen of "*Macropus giganteus*" was found to have the median vaginal canal ending blindly; and the figure shows its posterior end quite free from the urogenital chamber.

<sup>1</sup> Der zool. Garten, viii. 1867, p. 418 & p. 471.

<sup>2</sup> Der zool. Garten, x. 1869, p. 61.

<sup>3</sup> Halle Zeitschrift, iii. 1871, p. 526.

<sup>4</sup> P. Z. S. 1875, p. 57.

<sup>5</sup> Beiträge zur Kenntniss des weiblichen Urogenitalsystems der Marsupialen, von Arnold Brass. Leipzig, 1880.

In three specimens of *Halmaturus bennetti* the condition of the median canal is alluded to. In one (p. 17), "Der durch die Verschmelzung der oberen Theile der vaginæ zu Stande gekommene mittlere Theil desselben, welcher uns bisher [*i. e.* in the forms before described] als Blindsack entgegentrat . . . bleibt bei *Macropus bennetti* nicht Blindsack, sondern öffnet sich direct gegen den sinus urogenitalis hin." Another specimen, named *Macropus bennetti*, and having its generative organs fully developed, agreed with this in all respects except that there was no median communication, a quite thin partition separating the two chambers. This circumstance led to doubt in the author's mind as to the identity of the species. The open condition was also found "bei einem noch nicht ausgewachsenen Exemplare von *M. bennetti*."

In a specimen of the genus *Hypsiprymnus* (sp. ?) the median portion of the vaginæ is described and figured as extending nearly as far back as the urogenital sinus, but not coalescing therewith.

In 1879<sup>1</sup> Alix published the following:—"En étudiant en 1866 les organes de la génération d'un *Halmaturus bennettii* j'avais trouvé que le fond du vagin médian s'ouvrait directement dans le vestibule urogenital et j'avais cru pouvoir en conclure que cet orifice devait donner passage au fœtus conformément à l'opinion admise autrefois par Everard Home—opinion combattue par Cuvier et par M. R. Owen qui n'ont trouvé aucune trace de cet orifice sur le Kangaroo géant. Depuis ce moment cette question n'a pas cessée de me préoccuper, mais je n'ai trouvé que bien rarement l'occasion de faire de nouvelles vérifications. Les *Halmaturus* étant beaucoup plus communs en Europe, j'ai pu renouveler plusieurs fois ma première observation; mais de l'autre part je n'ai pas trouvé de communication entre le vagin médian et le vestibule urogénital soit sur le Sarigue, soit sur le Péramèle, et je n'en ai pas trouvé non plus chez un Kangaroo géant (*Macropus major*) où le fond du vagin médian était comme sur les sujets disséqués par Cuvier et par M. R. Owen, séparé du vestibule par une petite couche de tissu conjonctif.

"Ces faits me portaient à admettre définitivement que les *Halmaturus* réalisaient une exception, quand de nouvelles observations m'ont fait voir que la question ne peut pas encore être résolue de cette manière.

"1°. Sur une Phascolome wombat le vagin médian communiquait avec le vestibule urogénital par un petit pertuis bien distinct. Une injection d'eau poussée dans la poche sortit par cet orifice, et un petit stylet introduit doucement par l'ouverture pénétra dans la poche.

"2°. Sur deux Kangaroos roux (*M. rufus*) la communication se faisait par un large orifice. L'un d'eux avait produit un petit, mais chez ce petit, qui était une femelle et dont la taille atteignait le  $\frac{1}{3}$  de celle de la mère, la communication n'existait pas et la conformation était semblable à celle que l'on a observée jusqu'ici chez le *M. major*.

"En voyant que chez le *M. rufus* la communication ne se fait qu'après la naissance on est porté à penser qu'il pourrait bien

<sup>1</sup> Bulletin Société Zoologique de France, 1879, p. 118.

être de même chez le *M. major* et que la question ne sera entièrement résolue pour cette espèce qu'après l'examen de l'appareil génital d'une femelle qui aura certainement accompli l'acte de la parturition."

We will state here what we have been able to gather from the preparations in the Museum of the Royal College of Surgeons which have any bearing on this point.

The preparation 2739 of the Physiological series is an example of the generative organs of a young *Macropus major*, in which the median canal is stated in the Catalogue to be closed.

No. 2740 and 2740 B exhibit preparations of the same species, in which it is also closed.

No. 2740 C also exhibits the closed condition in the median canal "of the Kangaroo."

No. 2740 D has the following note relating to it in the corrected copy of the Catalogue (vol. iv. p. 157):—"No. 2740 D. The female organs of a small species of Kangaroo (*M. penicillatus*), showing a direct communication, through which a bristle is passed between the common mesial cul-de-sac and the urogenital sinus. (In Museum before 1861, but not catalogued.)"

In vol. v. p. 115 there is the following entry:—"3460 D. The female generative organs of the same species [*M. major*, Shaw] of Kangaroo, killed towards the close of uterine gestation, with the left impregnated uterus laid open, showing a portion of the thin unvascular chorion which enclosed the embryo and its appended sacs.

"Prepared by Mr. Owen from a specimen presented by Dr. Sweatman."

On examining the specimen itself it is found to be in the following condition:—The urogenital sinus has been slit up; and a window has been cut in the wall of the median vaginal chamber. Through the window in the latter the upper end of a brown glass rod is distinctly seen, while its lower portion is as plainly seen in the urogenital sinus. Now, in regard to this structure, upon which the catalogue is silent, the question naturally arises, to what is the glass rod intended to call attention? If its presence does not mean that there was naturally a communication between the two chambers, then what does it mean? If it be true that the two chambers really did communicate, then it is remarkable that such a unique specimen should never have been described.

In the article "Marsupialia" Prof. Owen speaks of having received an impregnated uterus (no gen. or sp. given) from Dr. Sweatman. It is possible that this specimen is identical with no. 3460 D in the Coll. of Surgeons Museum. In the same article there is also a reference to an impregnated uterus of *Macropus penicillatus*, which may possibly be identical with no. 2740 D quoted above; but neither in the Catalogue nor in the article is there any indication whether these specimens had already produced young or not.

The following specimens have come under our observation:—*Macropus rufus* (4).

a. Adult, with young in pouch.

- b.* Young of *a.*
- c.* An adult.
- d.* Nearly adult, not bred.

*Macropus major* (2).

- a.* Adult, bred.
- b.* Adult (?) from the Museum of Comparative Anatomy at Cambridge.

*Halmaturus bennetti* (1), adult.

*Halmaturus derbianus* (1), adult from Museum of Comparative Anatomy at Cambridge.

*Halmaturus ualabatus* (2).

- a.* A young one, not bred.
- b.* An adult, bred.

*Petrogale xanthopus* (3).

- a.* An adult, bred.
- b.* An adult, bred.
- c.* Young of *b.*, not bred.

*Dendrolagus inustus* (1), probably not bred.

*Hypsiprymnus gaimardi* (1), bred.

For permission to examine the two specimens from the Museum at Cambridge we are indebted to the courtesy of Mr. J. W. Clark. The other specimens are from the Gardens of the Society, and have been most liberally placed at our disposal by Mr. W. A. Forbes.

In the cases in which it is not stated whether young have been born or not, we have been unable to ascertain this point.

It will be convenient to commence the account of our specimens with the description of the *Macropus rufus* (*a*).

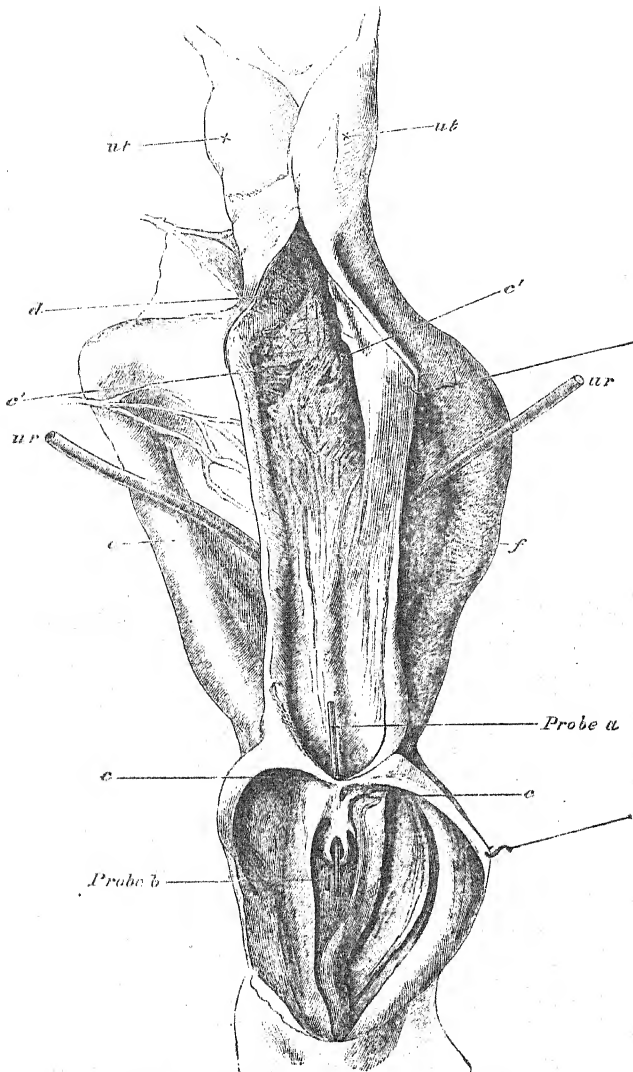
The animal died in the Society's Gardens on Oct. 12th. It was an adult; and a young one (*b*) only  $1\frac{1}{2}\frac{8}{10}$  in. long was found attached to a teat. The diminutive size of the young showed that it had only recently been born, and hence that the generative organs were in a condition most favourable for the study of the point under discussion, as they had just passed their condition of functional activity when the animal died.

External examination of them showed a corpus luteum, measuring a little more than  $\frac{1}{5}$  in. in its longest diameter, in the left ovary. The blood-vessels supplying the region were much dilated, giving it a very lurid appearance. The median vaginal chamber appeared more dilated, especially at its posterior part, than in the other specimens we have examined.

On opening the median chamber from the dorsal side (fig. 1, p. 985) the mucous membrane presented a red, highly vascular appearance, and it was covered with a soft mucous secretion. When the urogenital canal was opened, the median chamber was seen to open into it posteriorly by a distinct projecting orifice  $\frac{1}{4}$  inch in diameter. Immediately below this opening is another, that of the urethra (probe *b*). These two openings are situated in the middle line; on either



Fig. 1.

The vaginal apparatus of *Macropus rufus*, natural size.

The median vaginal canal and the urogenital sinus have been laid open from the dorsal side. A probe, *a*, is passed through the posterior unopened part of the median canal; the projecting orifice of the latter is seen between the two longitudinal folds, lying just dorsad of the opening of the urethra, through which probe *b* is passed. *ec*, the posterior openings of the lateral vaginal canals; *ec'*, their anterior openings; *d*, the opening of the left uterus; *ef*, the lateral vaginal canals; *ur*, the ureters; *ut*, the uteri.

side the ventral wall of the urogenital chamber is raised into two large distinct folds nearly  $\frac{1}{4}$  in. high, which run from the anterior end parallel with the long axis for some  $1\frac{1}{2}$  in., gradually subsiding as they proceed back. When the urogenital chamber was opened from the dorsal side, these folds were seen meeting one another in the middle line and quite shutting off from view the two orifices situated between them. This is just what Lucă observed in *Halmaturus billardieri*. The orifices of the lateral canals are outside these folds at the anterior end of the urogenital chamber. The folds thus divide off a ventral median from a dorsal compartment. The latter is most spacious at the sides where it is continuous with the lateral canals. The walls of the urogenital chamber are covered with fine papillæ.

With regard to the condition of the lateral vaginal canals, the lining membrane was of the usual yellowish-white colour; there was no appearance whatever either of special vascularity, or of their having been recently dilated by the passage of so large a body as the foetal young. A small delicate ridge on the ventral median wall of the anterior end of the median chamber, and a low rounded one at its posterior end, are the only evidences of its origin from two canals.

The condition of the urogenital organs of the specimen *b* will be described later. (See Note.)

With regard to *c*, we have not been able to obtain any direct evidence whether it had given birth to young or not. The urogenital organs presented a similar structure to those of *a*; but the walls of the median canal were much less vascular. The median canal opened by a well-marked orifice into the urogenital chamber.

The specimen *d* was bred in the Gardens, and was known not to have produced young.

The median vaginal chamber is well developed and somewhat dilated below. Its walls appear quite continuous with those of the urogenital chamber. The dorsal wall of the median vaginal chamber was opened; and the canal was found to end blindly posteriorly immediately dorsal to the orifice of the urethra; a thin semitransparent septum divided its cavity from that of the urogenital chamber. The two longitudinal folds in the latter are as well marked as in specimen *a*.

The first specimen (*a*) of *Macropus major* which has come into our possession had produced young in the Society's Gardens.

In this species the lateral canals describe a wider arch and the median canal became more narrow posteriorly than in *M. rufus*. In other respects the arrangement is similar. The median canal, instead of ending blindly as in the specimens hitherto described, communicates by a distinct and wide aperture with the urogenital sinus, in the same position as in *M. rufus a* and *c*. There are, however, no distinct longitudinal folds in the urogenital chamber. The muscular constrictions toward the posterior part of the lateral canals are well marked, so that a small probe was admitted with difficulty; a small fold of mucous membrane projects from the outer wall

into the cavity of the canal just beyond the constriction, which is so arranged as to form a valvular barrier to a body passing up the canal.

We have been unable to obtain any history of the second specimen of *M. major*, from the Museum at Cambridge.

The median vaginal canal had been opened in order to display the interior. The remains of a median septum were visible, and, besides this, two low crescent-shaped folds of the lining membrane, which extend with their concavity forward from the middle line of the ventral wall to the sides. The median canal when traced back becomes much narrowed; it can, however, be followed to a point where it abuts against the left lateral canal just as this opens into the urogenital chamber—at a point, that is, just to the left of the middle line. Although our specimen thus agrees with those of other observers, in the fact that the median chamber is a cul-de-sac, it differs from them in the fact that the walls are continuous by means of their proper tissue with those of the lateral and urogenital canals.

*Halmaturus bennetti* exhibits the open condition of the median canal. There were well-marked muscular thickenings in the lateral canals, but no valvular folds.

*Halmaturus derbianus* (no history) was in a similar condition; but the valvular fold was well marked.

The specimen *a* of *Halmaturus ualabatus* was the first example in which our attention was drawn to the subject.

It died in the Society's Gardens on June 30th. The measurement from the nose to the root of the tail was 16 inches—that is, 12 inches shorter than its mother. It was bred in the Gardens, and was taken on the list of the Society's collection on May 19th, *i. e.* at the time when it was old enough to leave the mother's pouch.

The evidence that she had not born young appears to us conclusive.

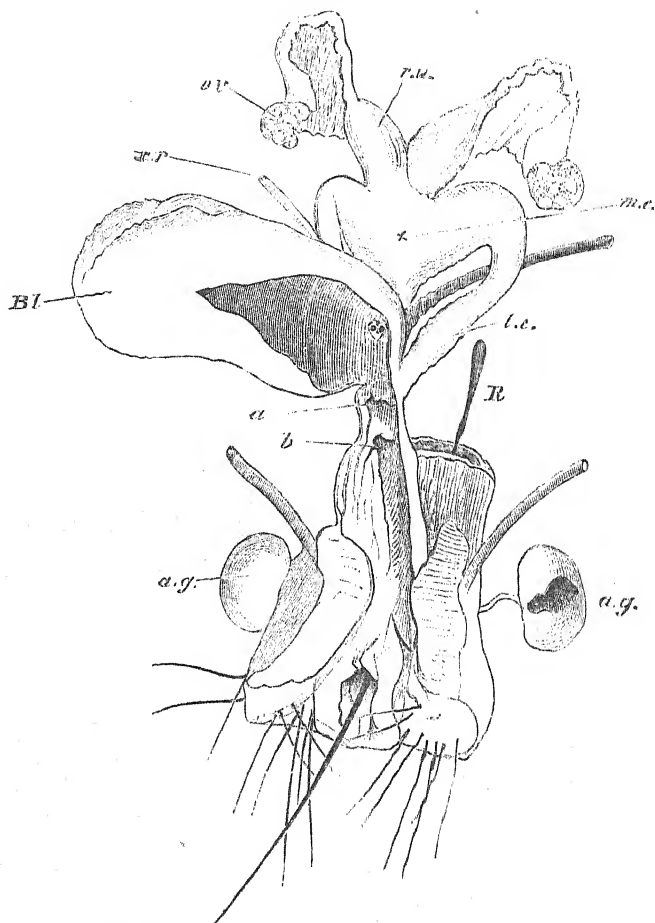
It will be observed that only 42 days had elapsed between the date of entry on the list and the date of death; so, if young had been produced, it must have been during that period. The period of gestation which Prof. Owen gives for *Macropus major* is 39 days. Assuming a period of about the same length for *H. ualabatus*, we must suppose that, if young had been produced, it was born towards the end of those 42 days, so that lactation would be at its height at the time of death. Now it was observed at the time (1) that there were no young in the pouch, and (2) that the teats were so small as not at first to be recognized; for we find from the notes taken at the time that it was not till after a second more careful examination that the four minute teats were seen, arranged in a crescentic line on the body-wall of the pouch.

We may take it for certain, then, that the specimen examined had not born young.

The arrangement found was as follows (see fig. 2, p. 988):—The median vaginal canal was wide in front and gradually contracted posteriorly, where it passed by a distinct opening into the urogenital chamber just above the opening of the urethra. The lateral canals

did not open immediately at the sides of this, but by a common opening about  $\frac{1}{4}$  in. further back. The constriction in the lateral canals was very distinct.

Fig. 2.

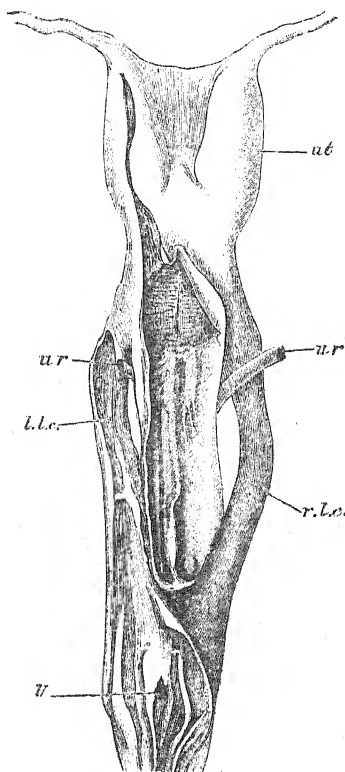


The generative organs of a young *Halmaturus vulabatus* (not bred). The bladder, urethra, and urogenital sinus have been cut open along the ventral median line. *a*, the opening of the median vaginal canal into the urogenital sinus; *a.g.*, anal glands; *b*, the common opening of the lateral canal into the urogenital sinus; *Bl.*, the bladder; *l.c.*, the lateral vaginal canal; *m.c.*, the median vaginal canal; *ov.*, ovary; *R.*, rectum; *u.*, ureter.

The other specimen (*b*) of this species was an adult which had born young in the Gardens. The median vaginal canal is distinctly

open. The two folds in the urogenital canal are well marked. In this specimen the lateral canals end, as usual, by the sides of this median opening, and not further back as in the young one (*a*). This may have been an individual peculiarity of *a*.

Fig. 3.



The vaginal apparatus of *Dendrolagus inustus*, natural size.

The left uterus, the median canal, the left lateral canal, and the urogenital sinus have been cut open along the dorsal aspect. *l.l.c.*, left lateral vaginal canal; *r.l.c.*, right lateral vaginal canal; *U*, the orifice of the urethra in the urogenital sinus; *ur*, the ureters; *ut*, the right uterus.

The constriction and cross fold in the lateral canals are very distinct.

Of the Rock-Kangaroos (*Petrogale xanthopus*), specimen *a* bore a minute young one in the pouch. The median vaginal chamber

exhibits a rather peculiar structure. The thin median septum—the remains of the coalesced inner walls of the primitively distinct canals—remains more perfect than usual; and at a point rather behind the middle of the median chamber the septum leaves the middle line and becomes joined to the right side, thus forming a right cul-de-sac. The left part of the chamber, however, is continued onward, becomes more spacious where the right-hand one has ceased, and opens by a distinct orifice in the usual position. The lateral canals are long, and show the constriction distinctly. The cross fold, though not prominent, is visible.

It may be remarked that when the lateral canals were opened they were found to be filled with a yellowish custard-like substance, in which lay several fibrous irregular structures. Similar hard bodies were found in the lateral canals of a specimen (2740 B) in the Museum of the Royal College of Surgeons. Microscopic examination showed no trace of spermatozoa.

The specimen *b* had a young one (measuring  $8\frac{1}{2}$  in. from the snout to the root of the tail) in its pouch. The young was also a female.

The condition of the vaginal canals of the mother was just as in specimen *a*, except that the median septum was less distinct, and the lateral canals were empty.

The minute generative organs of the young (*c*) (which of course had not bred) were dissected; and the median canal was found to end in two cæcal pouches separated from the urogenital chamber by a thin partition. Externally there is no indication whatever of separation between the end of the median chamber and the urogenital canal.

The specimen of *Dendrolagus inustus* was obtained young by the Society, and had lived alone in the Gardens for nearly three years. In all probability, then, it had not born young.

In this animal (fig. 3) the lateral vaginal canals are so closely applied to the median canal that dissection is required to separate them. They exhibit the constriction and cross fold very distinctly. The median canal has a well-marked median fold along its ventral wall; and delicate trabeculae traversing the chamber complete the septum here and there. Posteriorly the canal terminates blindly in two lateral cæca, which are bounded by a thin wall at the sides, where they abut against the part where the lateral canals open into the urogenital chamber. The middle line is occupied by a short partition formed by the coalesced inner walls of the converging lateral canals, see p. 989.

The specimen of *Hypsiprymnus gaimardi* had undoubtedly born young. The uteri open on prominences into the anterior end of the median vaginal canal; but the orifices are situated near one another on the dorsal wall, not at the sides as in other forms. The anterior part of the median septum is complete, and separates the two openings. The median canal is long and narrow, and passes down with a median ridge, but no further septum, and ends in two lateral culs-de-sac, one on either side of the middle line; but there is no opening.

The lateral canals pass at first directly outward from a point rather anterior to the uterine orifices; they then turn sharply backward, and after a long even course terminate as usual in the urogenital canal. The chief peculiarity of the lateral canals is that there is no thickening of the muscular walls at any point, and no contraction and no cross fold; the canal pursues an uninterrupted course.

In his paper (already cited) Brass describes a specimen of the genus *Hypsiprymnus* (species not given) which had a large bladder-like prolongation forward of the region, common to the median and lateral canals. The median canal is moreover represented as terminating some distance from the urogenital chamber. In both these points our specimen differs from his. His figure shows the clear passage down the lateral canal, with no muscular thickening and no constriction, very distinctly.

In the following Table the condition of the median canal in the foregoing examples is stated, and also the fact, where it has been ascertained, as to whether young have been born.

Species.	Statement whether young have been born or not.	Condition of median vaginal chamber.	Observers.
Kangaroo (gen. ? sp. ?) .....	?	Closed.	Home.
" " .....	?	Open.	"
" " .....	Yes.	Closed.	Seiler.
(2) " " .....	Yes.	"	Owen.
" " .....	Yes.	Open.	Carus.
(2) <i>Macropus major</i> .....	Yes.	Closed.	Owen <sup>1</sup> .
" " .....	?	"	Vrolik.
" " .....	?	"	Pagenstecher.
" " .....	?	"	Alix.
" " .....	No (?)	"	R.C.S. no. 2739.
(2) " " .....	?	"	R.C.S. nos. 2740 & 2740 B.
" " .....	?	Open.	R.C.S. no. 3460 D.
" " .....	Yes.	"	L. & F.
" " .....	?	Closed.	L. & F. (Camb. sp.).
(2) <i>Macropus rufus</i> ... ..	Yes.	Open.	Alix.
" " .....	No (young).	Closed.	"
(2) " " .....	Yes.	Open.	L. & F.
" " .....	No.	Closed.	"
<i>Macropus parryi</i> .....	?	Closed.	Owen.
<i>Macropus penicillatus</i> <sup>2</sup> ...	?	Open.	R.C.S. no. 2740 D.

<sup>1</sup> It is possible that these two are identical with the "Kangaroos" quoted above.

<sup>2</sup> We are informed by Mr. Forbes that this animal is properly a *Petrogale*.

TABLE (*continued*).

Species.	Statement whether young have been born or not.	Condition of median vaginal chamber.	Observers.
(3) <i>Halmaturus bennetti</i> .....	?	Open.	Poelman.
" " " .....	?	"	Owen.
(3) <sup>1</sup> " " " .....	?	"	Alix.
" " " .....	?	"	Luci.
" " " .....	Yes.	"	"
" " " .....	No (young).	Closed.	"
" " " .....	?	Open.	Brass.
" " " .....	?	Closed.	"
" " " .....	No (young).	Open.	"
" " " .....	?	"	L. & F.
<i>Halmaturus ruficollis</i> ( <i>bennetti</i> ) .....	?	Open.	Pagenstecher.
<i>Halmaturus billardieri</i> ...	?	Open.	Luci.
<i>Halmaturus ualabatus</i> .....	No.	Open.	L. & F.
" " " .....	Yes.	"	"
<i>Halmaturus derbianus</i> ...	?	Open.	L. & F. (Camp. sp.).
<i>Halmaturus agilis</i> .....	?	Open.	Forbes <sup>2</sup> .
<i>Petrogale xanthopus</i> .....	Yes.	Open.	L. & F.
" " " .....	Yes.	"	"
" " " .....	No (young).	Closed.	"
<i>Dorcopsis lactuosa</i> .....	Probably not.	Closed.	Garrod.
<i>Dendrolagus inustus</i> .....	?	Closed.	Owen.
" " " .....	Probably not.	"	L. & F.
" " " .....	?	"	Vrolik.
<i>Hypsiprymnus gainardi</i> ...	Yes.	Closed.	L. & F.
<i>Hypsiprymnus</i> (sp.?) .....	?	Closed.	Brass.
<i>Hypsiprymnus murinus</i> ...	?	Closed.	Owen.

Leaving aside for the present the "Kangaroos" which have not been referred to any genus or species, we will proceed to the evidence relating to *Macropus major*. The condition of the median canal in 11 instances is recorded. In two of these young had been produced, and it was closed. In one young had been produced, and it was open. In one young had probably not been produced, for it was a young one, and the median canal was closed. As to the remaining seven, in which the question is uncertain, six of them had the canal closed, and one only had it open. If it be true, as we shall afterwards try

<sup>1</sup> Three is the smallest number ("plusieurs" in addition to the original one.)

<sup>2</sup> Mr. W. A. Forbes has informed us of this example since the paper was read.



to show, that when the median canal is open and young have been born the young has passed through this opening on its way to the exterior, then the fact that this difference should exist among females which have born young—a difference not only in form but also in function—appears most strange.

With regard to the other species the evidence is far more satisfactory.

Six specimens of *Macropus rufus* have been examined: four of them had born young, and the median canal was open; two of them had not born young (one was not full-grown), and the canal was closed. This seems to show that in *M. rufus* an opening is formed in the median chamber either during pregnancy or at the time of parturition.

The two other species of *Macropus* are isolated examples, and do not throw any additional light on the subject.

The twenty examples of the genus *Halmaturus* may be considered together. It will be observed that in one young one (Lucä's *H. bennetti*) and in one adult (Brass's *H. bennetti*) the median canal was found to be closed, and that in all the rest, including two other young ones (Brass's *H. bennetti* and our *H. ualabatus*), it was open. This seems to show that in the genus *Halmaturus* the median canal may become open before the young have arrived at maturity, but that the thin septum which divides it from the urogenital sinus may remain perfect till after maturity is reached. In either case what evidence there is shows that after young have been born the canal is open.

Our three examples of *Petrogale xanthopus* bear out the same idea; but whether the cul-de-sac is converted into an open canal early (as in some Wallabies), or not till young are about to be born (as in *M. rufus*), the evidence is not sufficient to decide.

As to the specimen of *Dorcopsis luctuosa* and the three of *Dendrolagus inustus*, the evidence as to whether young had been born or not is not conclusive. As far as it goes, however, it is in favour of the latter supposition. That the canal would be open when young had been born, however, in the present state of the evidence it would be rash to assert.

The genus *Hypsiprymnus* offers a different condition from any we have considered: it had undoubtedly brought forth young; and as undoubtedly the median canal is closed. So far our specimen agrees with the examples of *Macropus major* described by Prof. Owen, and with the "Kangaroo" described by Seiler. It differs from the former, however, in the fact that the muscular thickening and constriction in the lateral canals, which are present in all our other specimens, are here absent. Thus in this case, in which the young passed down the lateral vaginal canals, we find a condition of these canals different from that of any of the other Macropodidæ which we have examined.

The observations on the Kangaroos whose species are not given are in agreement with those already considered. Home's two examples are similar to those of *Macropus rufus* already described; but it is not stated whether young had been born.

Carus's specimen, which had bred, corresponds with our example of *Macropus major*, with the other species of *Macropus*, and with the genera *Halmaturus* and *Petrogale*.

Seiler's specimen agrees with Prof. Owen's examples of *Macropus major*; but the extent to which the canals are sometimes found plugged with mucus renders his experiment with quicksilver not perfectly conclusive.

It appears not improbable that Prof. Owen's examples are identical with those of *Macropus major* referred to in his answer to Alix. These have been already considered.

With regard to the course taken by the young in its passage from the uteri, when the median canal is closed it must, of course, pass by one of the lateral canals, whether they be thin-walled and with an even diameter all the way, as in *Hypsiprymnus*, or narrowly constricted at part of their course as in *Macropus*. When the canal is open, however, it appears probable that the young passes through that opening, because it is the directer route and there is no narrow strait to traverse—a view which is supported by the condition in which we found the vaginal canals in the specimen of *Macropus rufus* which had lately produced young, and also by the evidence with regard to the species *M. rufus*; for there is one nearly full-grown example which had not produced young in which the median canal is closed, while in four others which had produced young the canal was open.

### Conclusion.

The following statements appear to be borne out by the evidence before us:—

In the very early condition of the Macropodidæ the median canal is closed.

In some genera, viz. *Macropus*, *Halmaturus*, *Petrogale* (*Dorcopsis* and *Dendrolagus*?) an opening is formed in the median canal to give passage to the young. This may take place early in life (*Halmaturus*), or not till young are about to be produced (*Macropus*).

In the species *Macropus major*, however, this opening may or may not exist, and the young may be transmitted either through the median or the lateral canal.

In the genus *Hypsiprymnus* the median canal remains closed, and the young passes down the lateral canals, which differ in their structure from those of the genera above quoted.

Many more observations will be necessary before the question can be settled for the Macropodidæ; and Alix's note on the Wombat shows that the open condition may be found outside the limits of this group.

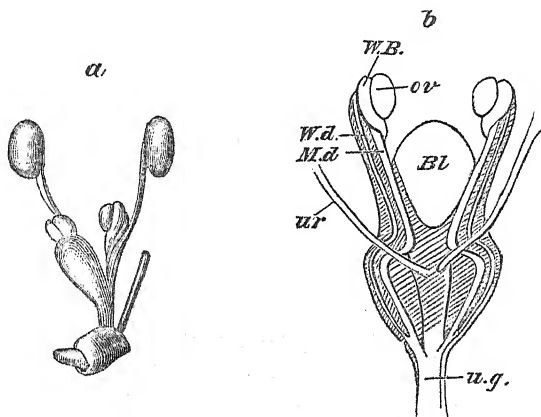
*Note.*—It may be well to state here the condition of the vaginal canals in the young specimen (*b*) of *Macropus rufus*.

Owing to the very rudimentary condition of the reproductive organs, it is not easy to determine the sex from them. The structure was examined by means of sections cut transverse to the long axis of the

body. The sections of the genital gland were compared with sections of the ovary and testes of the young Rabbit (22–30 days)<sup>1</sup>; and the structure was found to resemble the former rather than the latter, although the state of preservation of our specimen is not good enough to allow us to be certain. More satisfactory evidence is afforded by the fact that two oblique folds meeting behind are situated on the ventral abdominal wall, enclosing a rudimentary pouch. As we are not aware that any such rudiment is found in the male, we conclude that the specimen is a female.

Our sections show the Müllerian ducts opening anteriorly into the abdominal cavity. They pass backward along the margin of the Wolffian body by the side of the Wolffian ducts; as these two ducts

Fig. 4.



a. Sketch of urogenital organs of young *Macropus rufus*, from the left ventro-lateral aspect, magnified.

b. Diagram showing the arrangement of the ducts: *Bl*, bladder; *M.d*, Müllerian duct; *ov*, ovary; *u.g*, urogenital sinus; *ur*, ureter; *W.B*, Wolffian body; *W.d*, Wolffian duct.

pass backward they approach the middle line, the Müllerian duct being the inner, the Wolffian duct the outer of the two, while the ureters are external to the Wolffian ducts. Thus at first the Müllerian ducts of the two sides converge; they do not meet, however, the distance between them at their nearest point is three times the diameter of the Müllerian duct. After converging, the ducts pass directly outward, each accompanied by the Wolffian duct, to the outer region of the mass of mesoblast, in which all three sets of ducts (Müllerian, Wolffian, and ureters) are here embedded. They then turn backward again, while the ureters pass inward to the bladder. From this point the Müllerian and Wolffian ducts again converge. Posteriorly

<sup>1</sup> These sections were kindly lent us by Mr. F. M. Balfour.

the Müllerian and Wolffian ducts unite, thus leaving a single duct on each side; and these unite with one another and with the urethra at the same point to form the rudimentary urogenital chamber.

It is thus interesting to observe that the course of the Müllerian ducts in the young of the Kangaroo is essentially the same as that in the adult Opossums.

3. Description of a new Fruit-pigeon of the Genus *Carpophaga* from the Louisiade Archipelago. By H. B. TRISTRAM, F.R.S.

[Received December 9, 1881.]

I have lately received from Lieut. G. E. Richards, R.N., a collection of birds made by him in the Solomon Islands, New Britain, and several neighbouring islands.

The collection from New Britain and the Louisiade Archipelago consists of 62 species, 10 of which are represented in the collection both from Blanche Bay, New Britain, and from St. Aignan's Island, Louisiades. These are chiefly species which call for no remark, such as *Lorius hypœnochrous*, *Esacus magnirostris*, *Charadrius fulvus*, &c.

But there is one fine Fruit-pigeon which appears to me quite new, and which is represented by three specimens, one male and two females, all from St. Aignan's, Louisiade group. This I propose to describe as

*CARPOPHAGA SALVADORII*, sp. nov.

*C. capite, collo et thorace pallide vinaceis, annulo albo constricto ad basin cujusque mandibulæ, pectore et dorso superiore luteo vinaceis, hoc colore sensim transeunte in castaneum quo abdomen et crissum tinguntur; scapularibus resplendenti-nigris, figuram conspicuam tanquam V conjunctim formantibus; alis et dorso inferiore schistaceis; supracaudalibus et cauda nigris; hac fascia lata alba duos pollices ante terminum instructa; rostro cinereo; tarsi, pedibus et iride rubris.*

*Long. tot.* 16·75, *alc* 10·3, *caudæ* 6.

*Hab.* St. Aignan's Island, Louisiade Archipelago.

I have named this bird in compliment to Prof. Salvadori, to whom naturalists owe so much for his unwearied labours in elucidating the avifauna of Papuasias.

*C. salvadorii* differs from *C. pinon*, to which it is closely allied, by its rosy-coloured head, while the head of its congener is ashen grey, by the richer maroon colour of its upper back, by its lower back and rump being black instead of slate-grey, and by the light maroon of its upper back becoming more intense as it descends, instead of being, as in *C. pinon*, vinous shading off into slate-grey. The white tail-band is also much wider. The sexes are identical in plumage.

# APPENDIX.

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## LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1881.

- Jan. 1. 1 American Bison (*Bison americanus*), ♀. Purchased.  
 2 Common Swans (*Cygnus olor*). Presented by Salisbury Baxendale, Esq., F.Z.S.  
 3. 18 Indian Fruit-Bats (*Pteropus medius*). Presented by Messrs. Davies and Jolliff.  
 4. 1 Common Ocelot (*Felis pardalis*). Presented by Dr. Arthur Stradling, C.M.Z.S.  
 1 Thick-necked Tree-Boa (*Epicrates cenchris*). Presented by Dr. Arthur Stradling, C.M.Z.S.  
 6. 1 Yellow-lored Amazon (*Chrysotis xantholora*). Purchased.  
 8. 1 Smooth-bellied Snake (*Homalosoma lutrix*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 1 Rufescent Snake (*Leptodira rufescens*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 10. 2 Black-footed Penguins (*Spheniscus demersus*). Presented by William Catton Branford, Esq.  
 11. 1 White-nosed Saki (*Pithecia albinasa*). Purchased. See P.Z.S. 1881, p. 258, pl. xxix.  
 1 Brown Teetee (*Callithrix brunnea*). Purchased.  
 1 Three-banded Douroucouli (*Nyctipithecus trivirgatus*). Purchased.  
 1 Tana Tupaia (*Tupaia tana*). Purchased.  
 15. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.  
 1 Pied Wagtail (*Motacilla yarrellii*). Purchased.  
 17. 1 Little Grebe (*Podiceps minor*). Presented by J. H. Gurney, jun., Esq., F.Z.S.  
 19. 1 Serval (*Felis serval*). Presented by Captain Barrow.  
 2 Bell's Cinixys (*Cinixys belliana*). Presented by Captain Barrow.  
 20. 1 Common Coot (*Fulica atra*). Purchased.  
 25. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by Reginald Chauncy, Esq.  
 2 Pileated Broadtails (*Platyercus pileatus*). Purchased.  
 27. 2 Cirl Buntings (*Emberiza cirrus*). Purchased.  
 28. 1 Ocelot (*Felis pardalis*). Presented by Lieutenant C. E. F. C. Graham, R.N.

- Jan. 28. 1 Common Barn-Owl (*Strix flammea*). Presented by Mr. F. Page.  
 29. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by George Comyns, Esq.  
 31. 1 Hooper Swan (*Cygnus musicus*). Presented by Osgood H. Mackenzie, Esq.
- Feb. 1. 1 Red-fronted Lemur (*Lemur rufifrons*). Presented by Captain Romer.  
     5 Alpine Choughs (*Pyrrhocorax alpinus*). Purchased.  
 2. 2 Black Lemurs (*Lemur macaco*), ♂ ♀. Purchased.  
     1 Black-headed Lemur (*Lemur brunneus*). Purchased.  
     1 Red-fronted Lemur (*Lemur rufifrons*). Purchased.  
     1 Californian Quail (*Callipepla californica*), ♀. Received in exchange.  
     1 Brush Bronze-wing Pigeon (*Thaps elegans*), ♂. Deposited.  
     2 Red-throated Divers (*Colymbus septentrionalis*). Purchased.  
     3 Oyster-catchers (*Hamatopus ostralegus*). Purchased.  
     2 Brant Geese (*Bernicla brenta*). Purchased.  
 3. 2 Spanish Ichneumons (*Herpestes widdringtoni*). Presented by Fleetwood Sandeman, Esq., F.Z.S. From Spain.  
     1 Herring-Gull (*Larus argentatus*). Presented by Mr. C. Hunt.  
 5. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by A. Dowling, Esq.  
     1 Black-crested Cardinal (*Gubernatrix cristatella*). Presented by E. M. Ringrose, Esq.  
     1 Koala (*Phascolarctus cinereus*), ♂. Purchased.  
 8. 1 Rude Fox (*Canis rudis*). Presented by Mr. William Petty.  
     1 Hybrid Muntjac (between *Cervulus selateri* and *C. muntjac*), ♀. Born in the Menagerie.  
     1 Common Swallow (*Hirundo rustica*). Purchased.  
     2 Yellow-billed Sheath-bills (*Chionis alba*). Presented by Capt. James Ritchie.  
 10. 1 Red-eyed Ground-Finch (*Pipilo erythrophthalmus*). Purchased.  
 12. 4 Globose Curassows (*Crax globicera*), 1 ♂ and 3 ♀. Deposited.  
     1 Fringed-lipped Lampern (*Petromyzon branchialis*). Presented by A. H. Cocks, Esq., F.Z.S.  
     1 Jaguarundi Cat (*Felis jaguarundi*). Presented by Dr. Louis F. H. Birt.  
 14. 1 Ring-tailed Lemur (*Lemur catta*). Purchased.  
 15. 1 Arctic Fox (*Canis lagopus*). Presented by Miss Margeny May.  
     4 Common Swans (*Cygnus olor*). Presented by John Hargreaves, Esq.  
 16. 2 Mouflons (*Ovis musimon*), ♂ and ♀. Presented by the Duke of Marlborough, F.Z.S.  
 17. 2 Common Chameleons (*Chameleon vulgaris*). Presented by J. Blackstone, Esq., F.Z.S.  
 18. 1 Demeraran Cock of the Rock (*Rupicola crocea*), ♂. Received in exchange.  
 19. 1 Pennsylvanian Mud-Terrapin (*Cinosternon pennsylvanicum*). Deposited.  
     1 Mühlenburg's Terrapin (*Clemmys muelhemburgi*). Deposited.  
     A Collection of Sea-Anemones. Purchased.  
 21. 2 Globose Curassows (*Crax globicera*), 2 ♀. Purchased.  
     1 White-browed Amazon (*Chrysotis albifrons*). Purchased.

- Feb. 22. 1 Mona Monkey (*Cercopithecus mona*), ♂. Presented by W. Macnillan Scott, Esq.
23. 2 Common Peafowls (*Pavo cristata*), 2 ♀. Presented by Mrs. Edward Brown.
- 1 Stump-tailed Lizard (*Trachydosaurus rugosus*). Presented by F. O. Maitland, Esq.
24. 1 Bactrian Camel (*Camelus bactrianus*), ♀. Presented by Col. St. John, F.Z.S. See P. Z. S. 1881, p. 409.
25. 1 Horsfield's Tortoise (*Testudo horsfieldi*). Deposited.
26. 1 Blandford's Wild Sheep (*Ovis blandfordi*), ♂. Presented by Capt. W. Cotton, F.Z.S. See P. Z. S. 1881, p. 409.
- 1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by Miss Mary J. Richardson.
- Mar. 2. 1 Indian Leopard (*Felis pardus*), ♂. Presented by His Grace the Duke of Buckingham and Chandos.
- 1 Entellus Monkey (*Semnopithecus entellus*), ♀. Deposited.
3. 4 Indian Rat-Snakes (*Ptyas mucosa*). Purchased.
- 1 Matamora Terrapin (*Chelys matamora*). Purchased.
- 2 Derbian Sternotheres (*Sternotherus derbianus*). Purchased.
- 1 Bungoma River-Turtle (*Emyda granosa*). Purchased.
4. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
- 1 Blue-fronted Amazon (*Chrysotis festiva*). Deposited.
6. 1 Chinese Quail (*Coturnix chinensis*). Presented by Mons. J. M. Cornély, C.M.Z.S.
- 1 Wedge-tailed Fruit-Pigeon (*Treron sphenura*). Presented by Mons. J. M. Cornély, C.M.Z.S.
- 2 Red-chested Whydah Birds (*Vidua ardens*). Presented by Mons. J. M. Cornély, C.M.Z.S.
- 2 Calandra Larks (*Melanocorypha calandra*). Presented by Mons. J. M. Cornély, C.M.Z.S.
- 2 Variable Lizards (*Agama rudrata*). Presented by Mons. J. M. Cornély, C.M.Z.S.
- 2 Fire-tailed Finches (*Erythrura prasina*). Presented by Mons. J. M. Cornély, C.M.Z.S.
7. 1 Water-Vole (*Arvicola amphibius*). Purchased.
- 1 Ornamental Ceratophrys (*Ceratophrys ornata*). Presented by E. W. White, Esq., F.Z.S.
9. 2 Dingo Dogs (*Canis dingo*). Born in the Menagerie.
- 1 Gold Pheasant (*Thaumalea picta*), ♂. Presented by W. H. St. Quintin, Esq.
10. 1 Azara's Fox (*Canis azarae*). Presented by Mr. Wm. Petty.
- 1 Common Lobster (*Homarus vulgaris*). Presented by Mr. F. Trotman.
12. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by R. W. Oakes-Voysey, Esq.
14. 1 Rough-eyed Cayman (*Alligator sclerops*). Presented by Arthur C. Ponsonby, Esq.
15. 1 Tigrine Cat (*Felis tigrina*). Deposited.
- 1 Black-winged Peafowl (*Pavo nyripennis*), ♂. Presented by J. Marshall, Esq.
- 2 Bar-headed Geese (*Anser indicus*), ♂ and ♀. Purchased.
16. 1 Common Badger (*Meles meles*). Presented by Mrs. Locke.
- 1 Gooral Antelope (*Nemorrhædus goral*), ♂. Purchased. See P. Z. S. 1881, p. 450.
- 1 Javan Chevrotain (*Tragulus javanicus*). On approval.

- Mar. 17. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Deposited.  
 1 Ring-tailed Coati (*Nasua rufa*). Presented by Mrs. Fuller.
18. 1 White-fronted Capuchin (*Cebus albifrons*), ♀. Presented by C. Drake Sewell, Esq.
19. 1 Twelve-wired Bird of Paradise (*Seleucidia nigra*). Purchased. See P. Z. S. 1881, p. 450.  
 1 Red Bird of Paradise (*Paradisaea rubra*). Purchased. See P. Z. S. 1881, p. 450.  
 1 Black Manucode (*Manucodia atra*). Purchased. See P. Z. S. 1881, p. 450.  
 1 Horrid Rattlesnake (*Crotalus horridus*). Presented by C. A. Craven, Esq.  
 1 Deadly Snake (*Trionocephalus atrox*). Presented by Dr. A. Stradling, C.M.Z.S.
21. 1 Tiger (*Felis tigris*), ♂. Born in the Menagerie.  
 1 Long-snouted Snake (*Passerita mycterizans*). Presented by H. H. Black, Esq.
23. 1 Egyptian Gazelle (*Gazella dorcas*), ♂. Presented by the Earl of March, F.Z.S.  
 1 Amherst Pheasant (*Thaumalea amherstiae*), ♂. Purchased.  
 1 Black Swan (*Cygnus atratus*), ♀. Purchased.
24. 1 Common Genet (*Genetta vulgaris*), ♂. Presented by the Rev. F. P. Voules.  
 1 Sambar Deer (*Cervus aristotelis*), ♀. Born in the Menagerie.
25. 1 Giant Toad (*Bufo aqua*). Presented by Mr. Carl Hagenbeck.  
 1 Tarantula Spider. Presented by Mr. Carl Hagenbeck.  
 1 Hybrid Camel, bred between (*Camelus bactrianus* ♀ and *Camelus dromedarius* ♂). Born in the Menagerie.
29. 2 Four-horned Antelopes (*Tetraceros quadricornis*), ♂ and ♀. Received in exchange.  
 1 Burrhel Wild Sheep (*Ovis burrhel*), ♂. Received in exchange from the Zoological Gardens, Calcutta.  
 1 Javan Adjutant (*Leptoptilus javanicus*). Received in exchange.  
 1 Two-spotted Paradoxure (*Nandinia binotata*). Presented by A. W. Forbes, Esq.
30. 2 Golden Sparrows (*Passer euchloris*), ♂ and ♀. Presented by J. A. Abrahams, Esq.
31. 2 Aelian's Wart-Hogs (*Phacochoerus africanus*). Purchased.  
 1 Dusky Parrot (*Pionus violaceus*). Purchased.  
 3 Ceylonese Hanging Parrakeets (*Ioriculus asiaticus*). Purchased.  
 1 Yellow Troupial (*Xanthosomus flarus*). Purchased.  
 1 Fork-tailed Jungle-fowl (*Gallus furcatus*). Deposited.  
 1 Rock-hopper Penguin (*Eudyptes chrysocome*). Received in exchange.
- Apr. 1. 1 Chukar Partridge (*Caccabis chukar*). Presented by Mons. J. M. Cornély, C.M.Z.S.  
 1 Grey Francolin (*Francolinus ponticerianus*). Presented by Mons. J. M. Cornély, C.M.Z.S.  
 1 Common Crayfish (*Astacus fluviatilis*). Presented by H. Balfour, Esq.  
 2 Indian Antelopes (*Antilope cervicapra*), 2 ♂. Deposited.
5. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by R. J. Short, Esq.  
 1 Common Paradoxure (*Paradoxurus typus*). Presented by C. W. C. Fletcher, Esq.



- Apr. 5. 2 Short-headed Phalangiers (*Belideus breviceps*). Presented by D. W. Barker, Esq.
6. 3 Paradise Whydah Birds (*Vidua paradisica*), 3 ♂. Presented by Maurice C. Angel, Esq., F.Z.S.
- 1 Pin-tailed Whydah Bird (*Vidua principalis*), ♂. Presented by Maurice C. Angel, Esq., F.Z.S.
- 1 Red-shouldered Weaver Bird (*Urobrachya axillaris*). Presented by Maurice C. Angel, Esq., F.Z.S.
- 1 Wiener's Finch (*Pytelia wieneri*). Presented by Maurice C. Angel, Esq., F.Z.S.
- 1 Red-beaked Weaver Bird (*Quelea sanguinirostris*). Presented by Maurice C. Angel, Esq., F.Z.S.
- 2 Yellow-rumped Seed-eaters (*Crithagra chrysopyga*). Presented by Maurice C. Angel, Esq., F.Z.S.
- 1 Common Marmoset (*Hapale jacchus*). Deposited.
- 4 Chestnut-eared Finches (*Amadina castanotis*), 2 ♂ and 2 ♀. Purchased.
7. 1 Indian Chevrotain (*Tragulus meminna*). Purchased.
- 3 Common Crowned Pigeons (*Goura coronata*). Purchased.
- 1 American Tantalus (*Tantalus loculator*). Purchased.
8. 1 Indian Darter (*Plotus melanogaster*). Received in exchange from the Zoological Gardens, Calcutta. See P. Z. S. 1881, p. 626.
- 2 Laughing Kingfishers (*Dacelo gigantea*). Presented by Edward Trelawny, Esq.
- 1 Viverrine Cat (*Felis viverrina*). Presented by Major C. R. Oxley.
- 1 Common Lobster (*Homarus vulgaris*). Presented by Mr. F. Trotman.
9. 2 Slater's Curassow (*Craz slateri*), ♂ and ♀. Purchased.
- 1 Alexandrine Parrakeet (*Palæornis alexandri*), ♂. Presented by Mr. Henry Day.
- 2 Red-billed Tree-Ducks (*Dendrocygna autumnalis*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.
- 1 Sooty Amphisbæna (*Amphisbæna fuliginosa*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.
- 1 Common Gannet (*Sula bassana*). Presented by Mr. G. Randall.
- 6 Weeper Capuchins (*Cebus capucinus*). Purchased.
11. 1 Red-faced Saki (*Brachyurus rubicundus*). Deposited.
12. 1 Beisa Antelope (*Oryx beisa*), ♀. Born in the Menagerie. See P. Z. S. 1881, p. 626, pl. liv.
- 1 Banded Ichneumon (*Herpestes fuscatus*). Born in the Menagerie.
- 1 Squirrel-like Phalanger (*Belideus sciureus*). Born in the Menagerie.
- 1 Brown Bear (*Ursus arctos*). Deposited.
- 1 Common Rhea (*Rhea americana*). Presented by A. D. M. Stewart, Esq.
- 1 Horrid Rattlesnake (*Crotalus horridus*). Presented by Dr. Arthur Stradling, C.M.Z.S.
13. 1 Undulated Grass-Parrakeet (*Melopsittacus undulatus*). Presented by H. H. Johnston, Esq.
- 2 Californian Quails (*Callipepla californica*), 2 ♂. Presented by H. H. Johnston, Esq.
- 2 Common Quails (*Coturnix communis*). Presented by H. H. Johnston, Esq.

- Apr. 13. 1 Barred Dove (*Geopelia striata*). Presented by H. H. Johnston, Esq.  
 1 Nutmeg-Finch (*Mania undulata*). Presented by H. H. Johnston, Esq.  
 1 Greenfinch (*Ligurinus chloris*). Presented by H. H. Johnston, Esq.  
 1 Goldfinch (*Carduelis elegans*). Presented by H. H. Johnston, Esq.  
 2 Chaffinches (*Fringilla cœlebs*). Presented by H. H. Johnston, Esq.  
 2 Common Crossbills (*Loxia curvirostra*). Presented by H. H. Johnston, Esq.  
 1 Common Lapwing (*Vanellus cristatus*). Presented by H. H. Johnston, Esq.  
 2 Rufous-necked Weaver Birds (*Hypphantornis tector*). Presented by H. H. Johnston, Esq.  
 2 Mecca Pigeons (*Columba livia*, var.). Presented by H. H. Johnston, Esq.
14. 2 Ursine Dasyures (*Dasyurus ursinus*). Deposited.  
 1 Great Kangaroo (*Macropus giganteus*). Deposited.  
 3 Vulpine Phalangers (*Phalangista vulpina*). Deposited.  
 1 Mountain Ka-Ka (*Nestor notabilis*). Presented by Dr. A. de Latour, M.R.C.S. See P. Z. S. 1881, p. 626.
15. 2 Young Turtles (*Chelone viridis*). Presented by J. C. Robinson, Esq.  
 1 Common Viper (*Vipera berus*). Presented by J. Poyer Poyer, Esq.  
 2 Common Snakes (*Tropidonotus natrix*). Presented by J. Poyer Poyer, Esq.
19. 1 Vulpine Phalanger (*Phalangista vulpina*). Born in the Menagerie.
20. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.
21. 3 Entellus Monkeys (*Semnopithecus entellus*), 2 ♂, and 1 ♀. Purchased.  
 1 Common Otter (*Lutra vulgaris*), ♀. Received in exchange.
22. 1 Lion (*Felis leo*), ♀. Received in exchange.  
 1 Lion (*Felis leo*), ♀. Received in exchange.  
 3 Green Lizards (*Lacerta viridis*). Presented by E. H. Bland, Esq.  
 3 Short-tailed Wallabies (*Halmaturus brachyurus*). Presented by Sir Harry St. George Ord, C.B., H.M.Z.S.
23. 1 Common Carp (*Cyprinus carpio*). Presented by F. Roberts, Esq.  
 1 Rufous Rat Kangaroo (*Hypsiprymnus rufescens*). Presented by Mr. A. W. W. Wyatt.
25. 1 Japanese Teal (*Querquedula formosa*), ♂. Received in exchange.  
 1 Green-billed Toucan (*Rhamphastos dicolorus*). Purchased.  
 2 Matamata Terrapins (*Chelys matamata*). Purchased.
26. 1 Eyed Lizard (*Lacerta ocellata*). Presented by James Welford, Esq.  
 1 Indian Cobra (*Naia tripudians*). Presented by Mr. A. H. Jamrach.  
 2 Humboldt's Lagothrix (*Lagothrix humboldti*). Purchased.  
 3 Saddle-billed Storks (*Xenorhynchus senegalensis*). Purchased.  
 3 Roseate Spoonbills (*Platalea ajaja*). Purchased.

- Apr. 28. 1 Ludio Monkey (*Cercopithecus ludio*), ♀. Purchased.  
 3 Upland Geese (*Bernicla magellanica*), 2 ♂ and 1 ♀. Purchased.
29. 1 Silver Fox (*Canis fulvus*, var. *argentata*). Presented by Robert H. S. D. Lydston-Newman, Esq.  
 1 Goldfinch (*Carduelis elegans*), ♀. Presented by Robert Fletcher, Esq.  
 1 Snow-Bunting (*Plectrophanes nivalis*), ♀. Presented by Robert Fletcher, Esq.  
 2 Common Carp (*Cyprinus carpio*). Presented by F. Roberts, Esq.  
 1 Pike (*Esox lucius*). Presented by F. Roberts, Esq.
30. 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Presented by Mrs. J. S. Henderson.
- May 1. 1 Reeve's Muntjac (*Cervulus reevesi*), ♂. Born in the Menagerie.  
 2. 4 Cuning's Octodons (*Octodon cumingi*). Born in the Menagerie.  
 4 River-Lampreys (*Petromyzon fluviatilis*). Presented by A. H. Cocks, Esq., F.Z.S.  
 1 Collared Peccary (*Dicotyles tajaçu*). Presented by Mr. E. H. Dance.  
 1 Black-faced Spider Monkey (*Ateles ater*). Presented by Mr. E. H. Dance.
3. 1 Lesser White-nosed Monkey (*Cercopithecus petaurista*), ♀. Purchased.  
 2 Squirrel Monkeys (*Saimaris sciureus*). Purchased.  
 4 Negro Tamarins (*Midas ursulus*). Purchased.
4. 1 Blue-shouldered Tanager (*Tanagra cyanoptera*). Deposited.
5. 1 Roscate Cockatoo (*Cacatua roseicapilla*). Presented by Sir Charles C. Smith, Bart.  
 1 Swift (*Cypselus apus*). Presented by H. H. Johnston, Esq.  
 A collection of Sea-Anemones &c. Purchased.  
 2 Edible Snails (*Helix pomatia*). Presented by Lord Arthur Russell, M.P., F.Z.S.
9. 1 Indian Fruit-Bat (*Pteropus medius*). Presented by Edwin H. Maskell, Esq.  
 A collection of Hermit Crabs. Presented Mr. F. Trotman.
10. 2 Hybrid Peccaries (between *Dicotyles tajaçu* and *D. labiatus*). Born in the Gardens.  
 1 Wood-Brocket (*Cariacus nemorivagus*), ♂. Presented by Capt. Mackenzie.  
 2 Hawfinches (*Coccothraustes vulgaris*), ♂ and ♀. Presented by Dr. Bree.  
 1 Three-striped Paradoxure (*Paradoxurus trivirgatus*). Received in exchange from the Zoological Gardens, Calcutta.  
 1 Javan Adjutant (*Leptoptilus javanicus*). Received in exchange from the Zoological Gardens, Calcutta.
11. 3 Red-crested Whistling Ducks (*Fuligula rufina*). Bred in the Gardens.  
 1 Common Adder (*Vipera berus*). Presented by Mr. G. H. King.
12. 1 Common Hare (*Lepus europæus*). Presented by Mr. Wormald.  
 1 Egyptian Gazelle (*Gazella dorcas*), ♂. Presented by Mrs. J. J. Jones.  
 1 Blue-and-yellow Macaw (*Ara ararauna*). Deposited.

- May 13. 6 Rose-coloured Pastors (*Pastor roseus*). Purchased.  
 1 Geoffroy's Dove (*Peristera geoffroyi*). Born in the Gardens.  
 3 Viperine Snakes (*Tropidonotus viperinus*). Deposited.  
 14. 2 Mandarin Ducks (*Aix galericulata*), ♂ and ♀. Purchased.  
 16. 1 Bordeaux Snake (*Coronella girondica*). Presented by John Wellford, Esq.  
 2 Green Lizards (*Lacerta viridis*). Presented by John Wellford, Esq.  
 1 Eyed Lizard (*Lacerta ocellata*). Presented by John Wellford, Esq.  
 4 Viperine Snakes (*Tropidonotus viperinus*). Presented by John Wellford, Esq.  
 3 Lacertine Snakes (*Cælopettis lacertina*). Presented by John Wellford, Esq.  
 A collection of Marine Fishes. Presented by Mr. F. Trotman.  
 18. 2 Green Lizards (*Lacerta viridis*). Received in exchange.  
 19. 1 Eland (*Oreas canna*), ♂. Born in the Menagerie.  
 1 Chipping Squirrel (*Tamias striatus*). Presented by W. Basano, Esq.  
 1 Plantain-Squirrel (*Sciurus plantani*). Presented by W. Basano, Esq.  
 1 African Cheetah (*Felis jubata*). Presented by James S. Jameson, Esq.  
 1 Secretary Vulture (*Serpentarius reptilivorus*). Presented by James S. Jameson, Esq.  
 1 Chacma Baboon (*Cynocephalus porcarus*). Presented by James S. Jameson, Esq.  
 1 Ceylonese Hawk-Eagle (*Spizaetus ceylonensis*). Presented by G. Lyon Bennett, Esq.  
 6 Speckled Terrapins (*Clemmys guttata*). Purchased.  
 2 Painted Terrapins (*Clemmys picta*). Purchased.  
 20. 1 Loggerhead Turtle (*Thalassochelys caouana*). Presented by Earl Brownlow, F.Z.S.  
 3 Bull Frogs (*Rana mugiens*). Presented by Hugo Müller, Esq.  
 1 Noisy Frog (*Rana clamata*). Presented by Hugo Müller, Esq.  
 21. 1 Hybrid Bison (between *Bison americanus*, ♂, and hybrid *Bos frontalis*), ♀. Born in the Gardens.  
 22. 3 Spotted-billed Ducks (*Anas pacilorhyncha*). Bred in the Gardens.  
 23. 1 Bennett's Gazelle (*Gazella bennetti*?), ♂. Presented by Brigadier-General Tanner.  
 1 Mouflon (*Ovis musimon*), ♀. Born in the Gardens.  
 1 Slowworm (*Anguis fragilis*). Presented by Mr. G. Mengee.  
 24. 1 Common Marmoset (*Hapale jacchus*). Presented by C. Stewart, Esq.  
 1 Black-eared Marmoset (*Hapale penicillata*). Presented by C. Stewart, Esq.  
 1 Domestic Sheep (*Ovis aries*, var.), ♀. Presented by H. Druce, Esq., F.Z.S.  
 1 Common Paradoxure (*Paradoxurus typus*). Presented by H. Druce, Esq., F.Z.S.  
 3 Peacock Pheasants (*Polyplectron chinquis*), 2 ♂ and 1 ♀. Deposited.  
 25. 1 Chacma Baboon (*Cynocephalus porcarus*). Presented by Mrs. Findlay.

- May 25. 2 Ring-necked Pheasants (*Phasianus torquatus*), ♂ and ♀. Purchased.
- 2 Swinhoe's Pheasants (*Euplocamus swinhoii*), ♂ and ♀. Purchased.
- 1 Cashmere-Shawl Goat (*Capra hircus*, var.), ♀. Born in the Gardens.
26. 1 African Wild Ass (*Equus taniopus*), ♀. Purchased. See P. Z. S. 1881, p. 734.
- 4 Chilian Pintails (*Dafila spinicauda*). Purchased.
- 1 White-marked Duck (*Anas specularis*). Purchased. See P. Z. S. 1881, p. 734.
- 1 Antarctic Skua (*Stercorarius antarcticus*). Purchased.
- 1 Dominican Gull (*Larus dominicanus*). Purchased.
27. 1 Two-spotted Paradoxure (*Nandinia binotata*). Presented by W. H. Hart, Esq., C.M.Z.S.
- 3 Variegated Sheldrakes (*Tadorna variegata*). Bred in the Gardens.
29. 1 Globose Curassow (*Crax globicera*), ♀. Presented by Alan Lambert, Esq.
30. 2 Cuming's Octodons (*Octodon cumingi*). Born in the Gardens.
- June 1. 1 Vulpine Phalanger (*Phalangista vulpina*). Presented by Master H. Berridge.
- 1 Prince Albert's Curassow (*Crax alberti*), ♀. Purchased.
- 2 Ostriches (*Struthio camelus*), ♂ and ♀. Deposited.
- 2 Golden Agoutis (*Dasyprocta aguti*), ♀. Purchased.
- 2 Boas (*Boa constrictor*). Purchased.
2. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. Wm. Nugent.
- 5 Himalayan Monauls (*Lophophorus impeyanus*). Bred in the Gardens.
3. 4 Peacock Pheasants (*Polyplectron chinquis*). Bred in the Gardens.
- 1 White-backed Piping Crow (*Gymnorhina leucanota*). Deposited.
- 1 Laughing Kingfisher (*Dacelo gigantea*). Deposited.
- 10 Green Lizards (*Lacerta viridis*). Presented by H. N. Moseley, Esq., F.Z.S.
4. 1 Ruddy Sheldrake (*Tadorna rutila*). Bred in the Gardens.
5. 1 Japanese Deer (*Cervus sika*). Bred in the Gardens.
6. 1 Rhesus Monkey (*Macacus erythreus*). Born in the Menagerie.
- 1 Jameson's Gull (*Larus jamesoni*). Bred in the Gardens.
7. 1 Rhesus Monkey (*Macacus erythreus*). Presented by Hamilton Kerr, Esq.
8. 1 Common Ocelot (*Felis pardalis*), ♂. Presented by P. Leckie, Esq.
- 1 Cape Buffalo (*Bubalus caffer*). Born in the Menagerie.
- 1 Pileated Jay (*Cyanocorax pileatus*). Presented by W. Young, Esq.
9. 1 Lesser Sulphur-crested Cockatoo (*Cacatus sulphurea*). Deposited.
- 9 Summer Ducks (*Aix sponsor*). Bred in the Gardens.
10. 1 Chacma Baboon (*Cynocephalus porcarius*), ♂. Presented by Mrs. Robert Ross Robertson.
- 1 Japanese Deer (*Cervus sika*). Born in the Menagerie.
- 5 Waxwings (*Ampelis garrula*). Purchased.

- June 11. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by H. Aylesbury, Esq., Steam-Yacht 'Albion.'
- 2 Common Peafowls (*Pavo cristatus*), ♂ and ♀. Presented by George Stevenson, Esq.
13. 1 Rhesus Monkey (*Macacus erythraeus*). Born in the Menagerie.
14. 1 Cape Buffalo (*Bubalus capfer*). Born in the Menagerie.
- 1 Blue Jay (*Cyanocitta cristata*). Purchased.
- 1 Common Rook (*Corvus frugilegus*). Purchased.
- 7 Australian Wild Ducks (*Anas superciliosa*). Bred in the Gardens.
- 5 Chiloe Wigeons (*Marca chilensis*). Bred in the Gardens.
- 1 Mandarin Duck (*Aix galericulata*). Bred in the Gardens.
15. 1 Chacma Baboon (*Cynocephalus porcaricus*), ♀. Presented by Mr. Thornburgh-Cropper.
- 1 Horrid Rattlesnake (*Crotalus horridus*). Presented by Dr. A. Stradling, C.M.Z.S.
16. 4 Harvest-Mice (*Mus minutus*). Presented by Henry Laver, Esq.
- 2 Geoffroy's Doves (*Peristera geoffroyi*), ♂ and ♀. Bred in the Gardens.
- 2 Turquoise Parrakeets (*Euphema pulchella*). Bred in the Gardens.
17. 1 Putas Monkey (*Cercopithecus ruber*). Purchased.
- 1 Banded Grass-Finch (*Poephila cincta*). Presented by Mrs. Hylton Jolliffe.
- 2 Yellow-billed Liothrix (*Liothrix luteus*). Presented by Mrs. Hylton Jolliffe.
18. 1 Red-legged Partridge (*Caccabis rufa*), ♀. Presented by Arthur Morrell, Esq.
- 10 Ocellated Bladder-Frogs (*Cystignathus ocellatus*). Presented by Dr. A. Stradling, C.M.Z.S.
20. 2 Robust Gerbilles (*Gerbillus robustus*). Presented by Mons. Alphonse Milne-Edwards.
- 1 Red-throated Amazon (*Chrysotis collaria*). Deposited.
21. 1 D'Orbigny's Snake (*Heterodon d'orbignyi*). Presented by Dr. A. Stradling, C.M.Z.S.
- 1 Long-headed Snake (*Xenodon rhabdocephalus*). Presented by Dr. A. Stradling, C.M.Z.S.
22. 2 Red-handed Tamarins (*Midus rufimanus*). Presented by John Pesque, Esq.
- 1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by Mrs. Martin Smith.
- 1 Undulated Grass-Parrakeet (*Melopsittacus undulatus*). Presented by the Countess of Ellesmere.
23. 1 Horned Tragopan (*Cerionis satyra*). Bred in the Gardens.
- 1 Himalayan Monaul (*Lophophorus impeyanus*). Bred in the Gardens.
24. 1 Stanley Crane (*Tetrapteryx paradisea*). Presented by J. Sexton, Esq.
- 1 Senegal Chameleon (*Chameleon senegalensis*). Presented by J. Sexton, Esq.
- 3 Moustache-Monkeys (*Cercopithecus cephus*). Purchased.
- 1 Diana Monkey (*Cercopithecus diana*). Purchased.
- 1 Talapoin Monkey (*Cercopithecus talapoin*). Purchased.
- 2 Green Monkeys (*Cercopithecus callitrichus*). Purchased.
- 1 White-coloured Mangaby (*Cercocebus collaris*). Purchased.
- 1 Grey-cheeked Monkey (*Cercocebus albigena*). Purchased.

- June 24. 2 Water Chevrotains (*Hyomoschus aquaticus*). Purchased.  
 1 Peba Armadillo (*Tatusia peba*). Purchased.  
 1 Tamandua Anteater (*Tamandua tetradactyla*). Purchased.  
 1 Red-billed Toucan (*Ramphastos erythrorhynchus*). Purchased.  
 1 Crested Guinea-fowl (*Numida cristata*). Purchased.  
 1 Hawk's-billed Turtle (*Chelone imbricata*). Purchased.  
 1 Puff-Adder (*Vipera arietans*). Purchased.  
 25. 2 Laughing Kingfishers (*Dacelo gigantea*). Presented by Sir Hubert Sandford.  
 1 Marsh-Harrier (*Circus aeruginosus*). Presented by J. Wolfe Murray, Esq.  
 1 Lesser Kestrel (*Fimunculus cenchris*). Presented by W. Brodrick, Esq.  
 27. 1 Military Macaw (*Ara militaris*). Purchased.  
 29. 1 Wapiti Deer (*Cervus canadensis*), ♀. Born in the Gardens.  
 1 Daubenton's Curassow (*Crax daubentoni*), ♂. Presented by Capt. King.  
 1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by Capt. King.  
 1 Rough Terrapin (*Clemmys punctularia*). Presented by Lechmere Guppy, Esq.  
 10 Green Turtles (*Chelone viridis*). Presented by Messrs. Weil Brothers.  
 2 Yellow Snakes (*Chilobothrus inornatus*). Presented by Chas. B. Masse, Esq.  
 30. 1 Purple-faced Monkey (*Semnopithecus leucoprymnus*). Presented by Lieut. W. V. Anson, R.N.
- July 1. 1 Chaama Baboon (*Cynocephalus porcarius*). Deposited.  
 2. 1 Squirrel Monkey (*Chrysotrrix sciurea*), ♂. Purchased.  
 2 Hybrid Paradoxures (between *Paradoxurus leucomystax* ♀ and *Paradoxurus larvatus* ♂). Born in the Gardens.  
 2 Hybrid Gulls (between *Larus fuscus* and *Larus argentatus*). Bred in the Gardens.  
 4. 1 Tawny Eagle (*Aquila naevioides*). Purchased.  
 5. 1 Central-American Agouti (*Dasyprocta isthmica*). Presented by Mr. A. Melhuish.  
 3 Common Wigeons (*Mareca penelope*). Bred in the Gardens.  
 1 Common Rhea (*Rhea americana*). Purchased.  
 7. 1 Weeper Capuchin (*Cebus capucinus*). Presented by J. S. Chappelow, Esq.  
 1 Grey Ichneumon (*Herpestes griseus*), ♂. Presented by Arthur Tower, Esq.  
 1 Reeves's Muntjac (*Cervulus reevesi*), ♂. Born in the Gardens.  
 2 Piloted Jays (*Cyanocorax pileatus*). Presented by A. A. Dowly, Esq.  
 2 Scarlet Ibis (*Eudocimus ruber*). Bred in the Gardens.  
 9. 1 Cape Adder (*Vipera atropus*). Presented by Borradaile Pillans, Esq.  
 10. 8 Menobranchs (*Menobranchius lateralis*). Purchased. See P. Z. S. 1881, p. 818.  
 11. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Mrs. C. Hassell.  
 3 Common Peafowls (*Pavo cristatus*). Bred in the Gardens.  
 12. 8 Vulturine Guinea-fowls (*Numida vulturina*). Deposited.  
 13. 1 Sykes's Monkey (*Cercopithecus albogularis*). Deposited.

- July 13. 1 Red-handed Tamarin (*Midas rufimanus*). Presented by Mr. Keiser.  
 1 Grey Ichneumon (*Herpestes griseus*). Presented by Mr. C. R. Smith.
14. 1 American Black Bear (*Ursus americanus*), ♀. Presented by the Earl of Caledon, F.Z.S., and the Hon. Charles Alexander.  
 1 Common Raven (*Corvus corax*). Presented by Major Bott.  
 1 Siamese Pheasant (*Euplocamus proclatus*). Bred in the Gardens.  
 2 Cheer Pheasants (*Phasianus wallichii*). Bred in the Gardens.  
 2 Horned Tragopans (*Cerionis satyra*). Bred in the Gardens.
15. 1 Carrion-Crow (*Corvus corone*). Presented by Miss Mortimer.
16. 1 Indian Monitor (*Monitor dracena*). Presented by E. Linstedt, Esq.
20. 2 Black-tailed Parrakeets (*Polytelis melanurus*), 2 ♂. Presented by Gerald Arbutnot, Esq.
22. 1 Silver Fox (*Canis fulvus*, var. *argentata*). Presented by S. R. Platt, Esq.  
 3 Hedgehogs (*Erinaceus europæus*). Presented by W. Dunn, Esq., C.M.Z.S.  
 6 Black-and-white Geese (*Anseranas melanoleuca*). Received in exchange.  
 7 Australian Wild Ducks (*Anas superciliosa*). Received in exchange.
23. 1 Green Tree-Frog (*Hyla arborea*). Presented by Mrs. Humphry.  
 1 Abyssinian Pentonyx (*Pelomedusa ghefti*). Deposited.
25. 1 Common Adder (*Vipera berus*). Presented by Mr. J. Snow.
26. 1 Guinea Baboon (*Cynocephalus sphinx*), ♀. Deposited.  
 2 Common Jays (*Garrulus glandarius*). Presented by Arthur F. Astley, Esq.  
 A collection of Marine Fishes. Purchased.
27. 1 Surucuru or Bush-master (*Lachesis mutus*). Presented by C. A. Craven, Esq. See P. Z. S. 1881, p. 818.  
 4 Common Wigeon (*Mareca penelope*), 2 ♂ and 2 ♀. Purchased.
28. 2 Common Squirrels (*Sciurus vulgaris*). Presented by C. B. Barber, Esq.  
 1 Common Boa (*Boa constrictor*). Presented by G. H. Hawtayne, Esq.
29. 1 Common Cuckoo (*Cuculus canorus*). Presented by Mr. H. Morrison.  
 A collection of Sea-Anemones. Purchased.
30. 2 Blossom-headed Parrakeets (*Pulchornis cyanocephalus*). Purchased.  
 1 Laughing Kingfisher (*Dacelo gigantea*). Presented by Mr. Douglas.  
 1 Osprey (*Pandion haliaetus*). Purchased.
31. 2 Common Marmosets (*Hapale jacchus*). Presented by the Lord W. Gascoyne Cecil.
- Aug. 2. 2 Getulian Ground-Squirrels (*Xerus getulus*). Presented by Dr. Wm. Hume Hart.  
 2 Green Lizards (*Lacerta viridis*). Presented by Claud Russell, Esq.  
 3. 1 Sykes's Monkey (*Cercopithecus albogularis*), ♀. Presented by H. W. M. Shewell, Esq., R.N.



- Aug. 3. 1 Common Polecat (*Mustela putorius*). Presented by Mr. H. C. Brooke.  
 2 Wood-Owls (*Syrnium aluco*). Presented by H. T. Archer, Esq.  
 1 Common Chameleon (*Chamæleon vulgaris*). Deposited.  
 1 Bennett's Wallaby (*Halmaturus bennetti*), ♂. Born in the Gardens.
4. 1 Bateleur Eagle (*Heliotarsus ecaudatus*). Presented by W. Waters, Esq.  
 1 Slowworm (white var.) (*Anguis fragilis*). Presented by A. Phipson, Esq.
5. 1 Erxleben's Monkey (*Cercopithecus erxlebeni*), ♀. Purchased.  
 2 Black Storks (*Ciconia nigra*). Presented by Dr. Rudolph Blasius.  
 1 Black-footed Penguin (*Spheniscus demersus*). Presented by Capt. J. C. Robinson.
8. 2 Topela Finches (*Munia topela*). Purchased.  
 2 Common Mynahs (*Acridotheres tristis*). Purchased.  
 2 Serin Finches (*Serinus hortulanus*). Purchased.  
 1 Fraser's Eagle-Owl (*Bubo poensis*). Purchased.  
 2 Derbian Zonures (*Zonurus derbianus*). Purchased.  
 2 Aldrovandi's Skink (*Plestiodon auratus*). Purchased.  
 2 Pantherine Toads (*Bufo pantherinus*). Purchased.  
 1 Orange-winged Amazon (*Chrysotis amazonica*). Presented by Richard Seyd, Esq., F.Z.S.
9. 1 Grey Ichneumon (*Herpestes griseus*). Presented by Sir Patrick Colquhoun, F.Z.S.  
 1 Herring-Gull (*Larus argentatus*). Presented by E. A. Brown, Esq.
10. 1 Nutmeg-Finch (*Munia punctularia*). Purchased.  
 1 Bar-breasted Finch (*Munia nisoria*). Purchased.  
 1 White-crested Touracou (*Corythaix albocristatus*). Presented by Capt. T. G. Steer.
11. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. H. Dummatt.  
 2 Common Marmosets (*Hapale jacchus*), ♂ and ♀. Deposited.  
 1 Black-eared Marmoset (*Hapale penicillata*). Presented by Mrs. Alsop.  
 A collection of Marine Fishes. Purchased.
12. 1 Bay-Antelope (*Hyomoshus aquaticus*). Purchased.
13. 1 American Tapir (*Tapirus terrestris*), ♂. Presented by Fritz Zurcher, Esq.  
 2 West-Indian Agoutis (*Dasyprocta cristata*). Presented by H. J. Burford Hancock, Esq., F.Z.S.  
 2 Martinican Doves (*Zenaida martinicana*). Presented by H. J. Burford Hancock, Esq., F.Z.S.  
 3 Garden's Night-Herons (*Nycticorax gardeni*). Presented by H. J. Burford Hancock, Esq., F.Z.S.  
 2 Wood-Pigeons (*Columba palumbus*). Presented by A. E. C. Streatfield, Esq.  
 A collection of Sea-Anemones. Purchased.
15. 1 Ring-tailed Lemur (*Lemur catta*). Presented by E. O. Brookfield, Esq.  
 2 Vulpine Phalangiers (*Phalangista vulpina*), ♂ and ♀. Presented by Mr. Geo. White.
16. 1 Lesser White-nosed Monkey (*Cercopithecus petawista*), ♂ Purchased.

- Aug. 13. 1 Lesser Sulphur-crested Cockatoo (*Cacatua sulphurea*). Presented by Mrs. Beard.
- 1 Spider Crab. Presented by Mr. J. Ward.
17. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Mr. R. Edge.
- 1 White-collared Mangabey (*Cercocebus collaris*). Presented by James Jamieson.
- 2 Plant Monkeys (*Cercopithecus pluto*), 2 ♀. Purchased.
- 1 Pampas Deer (*Capreolus campestris*). Born in the Menagerie.
18. 1 Royal Python (*Python regius*). Presented by G. H. Garrett, Esq.
- 1 Tench (*Tinca vulgaris*). Presented by Mr. R. W. Thompson.
19. 1 Diana Monkey (*Cercopithecus diana*), ♀. Presented by Louis Wyatt, Esq.
- 2 Wonga-Wonga Pigeons (*Leucosarcia picta*). Presented by J. Barham, Esq.
- 1 Zebu (*Bos indicus*). Born in the Gardens.
20. 1 Grey Parrot (*Psittacus erithacus*). Deposited.
22. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by the Rev. George Cuffe.
- 2 Arabian Gazelles (*Gazella arabica*), 2 ♂. Presented by Reginald Zohrab, Esq.
- 3 Domestic Pigeons (*Columbaenas*, var.). Presented by Reginald Zohrab, Esq.
- 2 European Scops Owls (*Scops giu*). Purchased.
23. 2 Guinea Baboons (*Cynocephalus sphinx*), 2 ♂. Presented by Lionel Hart, Esq.
- 1 Grivet Monkey (*Cercopithecus griseo-viridis*, var.). Presented by Lionel Hart, Esq.
- 1 Chinese Sea-Eagle (*Haliaeetus albicilla*). Deposited.
24. 1 Red-and-blue Macaw (*Ara macao*). Presented by Mrs. Supple.
- 2 Common Barn-Owls (*Strix flammea*). Presented by C. T. Foster, Esq.
- 2 Common Kestrels (*Tinnunculus alaudarius*). Presented by Mr. J. Edwards.
- 1 Upland Goose (*Bernicla magellanica*), ♀. Presented by A. Nesbitt, Esq.
25. 2 Common Squirrels (*Sciurus vulgaris*). Presented by Lieut.-Col. F. D. Walters, 52nd Regt.
- 1 Ring-tailed Cat (*Nasua rufa*), ♀. Presented by L. H. Haworth, Esq.
26. 1 Collared Peacery (*Dicotyles tajacu*). Presented by Capt. W. F. Wardroper.
27. 1 Common Marmoset (*Harpale jacchus*). Deposited.
- 1 Bonnet-Monkey (*Macacus radiatus*). Deposited.
29. 1 Central-American Agouti (*Dasyprocta isthmica*). Presented by J. E. Sharpe, Esq.
- 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
- 1 Black-headed Caique (*Caica melan-cephala*). Purchased.
30. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by James W. Duncan.
- 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
- 2 Domestic Pigeons (*Columba livia*). Presented by R. Zohrab, Esq.

- Sept. 1. 3 Common Chameleons (*Chamæleon vulgaris*). Presented by A. R. Rogers, Esq.
- 2 Spotted Cavies (*Cacogenys paca*). Presented by Dr. Portella.
3. 2 Malbrouck Monkeys (*Cercopithecus cynosurus*). Presented by H. P. Sherlock, Esq.
5. 1 Brazilian Tanager (*Ramphocælus brasilius*), ♀. Presented by Dr. Arthur Stradling.
- 1 Green Lizard (*Lacerta viridis*). Presented by the Misses Parry.
6. 1 Grey Parrot (*Psittacus erithacus*). Deposited.
- 4 Passerine Parrots (*Psittacula passerina*). Deposited.
- 2 Lineated Finches (*Spermophila lineata*). Deposited.
- 1 Blue-shouldered Tanager (*Tanagra cyanoptera*). Presented by Ernest L. Marshall, Esq.
- 2 Pantherine Toads (*Bufo pantherinus*). Presented by R. E. Holding.
8. 1 Goffin's Cockatoo (*Cacatua goffini*). Deposited.
- 2 Greater Black-backed Gulls (*Larus marinus*). Presented by Mr. A. Allen.
- 6 Common Chameleons (*Chamæleon vulgaris*). Purchased.
10. 1 Wall-Lizard (*Lacerta muralis*). Presented by J. Lewis, Esq.
- 6 Common Lizards (*Lacerta vivipara*). Presented by J. T. Mann, Esq.
- 2 Smooth Snakes (*Coronella lævis*). Presented by J. T. Mann, Esq.
- 2 Sand-Lizards (*Lacerta agilis*). Presented by J. T. Mann, Esq.
13. 1 Black-faced Spider Monkey (*Ateles ater*). Purchased.
- 1 Diamond-Snake (*Morelia spilotes*). Presented by C. C. Skarratt, Esq.
14. 1 Rusty-spotted Cat (*Felis rubiginosa*). Presented by Charles E. Pole Carew, Esq. See P. Z. S. 1881. p. 818.
- 1 Common Lobster (*Homarus vulgaris*). Presented by Mr. Milestone.
- 2 Common Lobsters (*Homarus vulgaris*). Purchased.
16. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by Mrs. Paterson.
- 1 Brown Bear (*Ursus arctos*). Presented by Messrs. Morgan, Gellibrand, & Co.
- 2 Spanish Terrapins (*Clemmys leprosa*). Presented by Major Rooke.
- 2 Dwarf Chameleons (*Chamæleon pumilus*). Presented by Duncan W. B. Swaine, Esq.
17. 2 Chukar Partridges (*Caccabis chukar*). Presented by Col. Thos. Pierce, 16th Regt. Bombay N.I.
18. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Harding Cox, Esq.
- 2 Cape Crowned Cranes (*Balcarica chrysopelargus*). Deposited.
- 2 Wattled Cranes (*Grus carunculata*). Deposited.
- A collection of Sea-Anemones. Purchased.
19. 1 Bonnet-Monkey (*Macacus radiatus*), ♂. Presented by J. Thompson, Esq.
20. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by Mr. C. Green.
- 1 Banded Ichneumon (*Herpestes fasciatus*), ♀. Presented by W. Cubitt, Esq.
- 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.

- Oct. 13. 2 Egyptian Quanzans (*Phammossaurus scincus*). Presented by N. H. Berke.
14. 1 Mesopotamian Fallow Deer (*Cervus mesopotamicus*), ♀. Presented by Lord Lilford, F.Z.S.  
 2 Beatrix Antelope (*Oryx beatrix*), 2♀. Presented by Lord Lilford, F.Z.S. See P. Z. S. 1881, p. 819.  
 2 Arabian Gazelles (*Gazella arabica*), ♂ and ♀. Presented by Lord Lilford, F.Z.S.  
 1 Bell's Ciniyys (*Ciniyys belliana*). Deposited.
17. 1 Sooty Mangabey (*Cercocebus fuliginosus*), ♂. Purchased.  
 1 Ariel Toucan (*Ramphastos ariel*). Purchased.  
 1 Naked-footed Owllet (*Athene noctua*). Purchased.  
 1 Ornamented Hawk-Eagle (*Spizæetus ornatus*). Purchased.  
 1 Black Tortoise (*Testudo carbonaria*). Purchased.  
 2 Radiated Tortoises (*Testudo radiata*). Purchased.  
 1 Argentine Tortoise (*Testudo argentina*). Purchased.  
 1 Black-headed Gull (*Larus ridibundus*). Presented by Master Rew Lloyd.
18. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by G. R. J. Glennie, Esq.
19. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♀. Presented by Mr. J. Pope.  
 1 Black-faced Kangaroo (*Macropus melanops*), ♂. Presented by Miss Drax.  
 1 Snow-Bunting (*Plectrophanes nivalis*). Presented by H. A. Macpherson, Esq.  
 A collection of Marine Fishes. Purchased.
20. 1 Gaimard's Rat-Kangaroo (*Hypsiprymnus gaimardi*). Born in the Gardens.  
 2 Common Kestrels (*Tinnunculus alaudarius*). Presented by Masters John and Charles Godfrey.
21. 1 Chinese Rhesus Monkey (*Macacus lasiotus*). Deposited.
22. 1 Rhesus Monkey (*Macacus erythraus*), ♀. Presented by Miss Richardson.
24. 1 Smooth-headed Capuchin (*Cebus monachus*), ♂. Deposited.  
 1 Richardson's Skua (*Stercorarius crepidatus*). Deposited.
25. 1 Green Monkey (*Cercopithecus callitrichus*). Presented by Mr. G. Aldridge.  
 1 Hooded Crow (*Corvus cornix*). Purchased.  
 2 Grey Plovers (*Squatarola helvetica*). Purchased.  
 1 Ruff (*Machetes pugnar*). Purchased.  
 1 Bar-tailed Godwit (*Limosa lapponica*). Purchased.  
 1 Common Rook (*Corvus frugilegus*).
26. 1 Green-cheeked Amazon (*Chrysotis viridigenalis*). Purchased.  
 1 Finsch's Amazon (*Chrysotis finschi*). Purchased.  
 2 Tuatera Lizards (*Sphenodon punctatus*). Deposited.  
 2 Tuatera Lizards (*Sphenodon punctatus*). Presented by C. Smith, Esq.
29. 1 Ring-tailed Coati (*Nasua rufa*). Presented by Francis B. Noreliffe, Esq.  
 1 Tarantula Spider (*Mygale*, sp. inc.). Presented by Charles A. Craven, Esq.  
 1 Millipede (*Julus*, sp. inc.). Presented by Charles A. Craven, Esq.
31. 1 Tiger (*Felis tigris*), ♀. Presented by Col. Owen Williams, M.P., F.Z.S.

- Nov. 1. 1 American Black Bear (*Ursus americanus*). Presented by Capt. M'Pherson.
2. 1 Young Ostrich (*Struthio camelus*). Presented by Wm. Jeram, Esq.
3. 1 Great Eagle-Owl (*Bubo maximus*). Deposited.
4. 2 Polecats (*Mustela putorius*). Presented by Mons. M. P. Pichot.
- 1 Hybrid Finch (between *Ligurinus chloris* and *Linota cannabina*). Presented by H. A. Macpherson, Esq.
- A collection of Sea-Anemones. Purchased.
5. 2 Red-throated Divers (*Colymbus septentrionalis*). Purchased.
6. 46 Nose-horned Vipers (*Vipera nasicornis*). Born in the Gardens. See P. Z. S. 1881, p. 967.
8. 1 Ring-necked Parrakeet (*Palaeornis torquata*). Presented by the Countess Dowager of Lonsdale.
9. 1 Pluto Monkey (*Cercopithecus pluto*), ♂. Purchased.
- 1 Sykes's Monkey (*Cercopithecus albogularis*). Purchased.
- 1 Darwin's Rhea (*Rhea darwini*). Purchased.
- 1 Picazuro Pigeon (*Columba picazuro*). Purchased.
- 2 Spotted Zenaida Doves (*Zenaida maculata*). Purchased.
- 2 Dominican Gulls (*Larus dominicanus*). Purchased.
- 1 Dufresne's Amazon (*Chrysotis dufresniana*). Deposited.
- 1 Yellow-cheeked Amazon (*Chrysotis autumnalis*). Deposited.
- 1 Orange-winged Amazon (*Chrysotis amazonica*). Deposited.
10. 2 Grey Wagtails (*Motacilla sulphurea*). Presented by Mr. Swaysland.
11. 2 Vulpine Phalangiers (*Phalangista vulpina*), 2 ♂. Presented by F. J. Horniman, Esq., F.Z.S.
- 1 Rufous Rat Kangaroo (*Hypsiprymnus rufescens*), ♂. Presented by F. J. Horniman, Esq., F.Z.S.
- 1 Red-fronted Lemur (*Lemur rufifrons*). Purchased.
12. 2 Long-eared Owls (*Asio otus*). Presented by the Rev. J. A. Wix.
14. 1 Moustache-Monkey (*Cercopithecus cephus*), ♂. Presented by Frank G. S. Laye, Esq.
- 2 Herring-Gulls (*Larus argentatus*). Presented by Mrs. Greaves.
15. 2 Chilean Sea-Eagles (*Geronaetus melanoleucus*). Purchased.
18. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by the Rev. R. H. Manley.
- 1 Slavonian Grebe (*Podiceps cornutus*). Purchased.
- 1 Red-breasted Merganser (*Mergus serrator*). Purchased.
- 1 Guillemot (*Uria troile*). Purchased.
- 1 Bar-tailed Godwit (*Limosa lapponica*). Purchased.
21. 1 Weasel (*Mustela vulgaris*). Purchased.
- 1 Blackbird (*Turdus merula*). Presented by Edward Lawrence, Esq.
- 2 Song-Thrushes (*Turdus musicus*). Presented by Edward Lawrence, Esq.
- 2 Sky-Larks (*Alauda arvensis*). Presented by Edward Lawrence, Esq.
- 1 Greenfinch (*Ligurinus chloris*). Presented by Edward Lawrence, Esq.
- 2 Chaffinches (*Fringilla caelebs*). Presented by Edward Lawrence, Esq.
- 2 Common Quails (*Coturnix communis*). Presented by Edward Lawrence, Esq.
23. 2 Orange-cheeked Waxbills (*Estrelda melpoda*). Deposited.
- 2 Common Waxbills (*Estrelda cinerea*). Deposited.

- Nov. 23. 2 Maja Finches (*Munia maja*). Deposited.  
 1 Black-headed Finch (*Munia malacca*). Deposited.  
 1 Indian Silver-Bill (*Munia malabarica*). Deposited.  
 1 Song-Thrush (*Turdus musicus*). Deposited.  
 1 Black-winged Peafowl (*Pavo nigripennis*), ♀. Presented by J. Marshall, Esq.  
 2 Mandarin Ducks (*Aix galericulata*), ♂ and ♀. Received in exchange.  
 2 Brazilian Teal (*Querquedula brasiliensis*), ♂ and ♀. Received in exchange.  
 24. 1 Geoffroy's Dove (*Peristera geoffroyi*). Received in exchange.  
 1 Bar-tailed Godwit (*Limosa lapponica*). Purchased.  
 2 Razorbills (*Alca torda*). Purchased.  
 2 Common Lapwings (*Vanellus cristatus*). Purchased.  
 2 Golden Plovers (*Charadrius plumialis*). Purchased.  
 2 Knots (*Tringa canutus*). Purchased.  
 1 Black-throated Diver (*Colymbus arcticus*). Purchased.  
 25. 1 Vervet Monkey (*Cercopithecus lalandii*). Presented by R. M. Edger, Esq.  
 1 Grecian Ibex (*Capra agagrus*), ♂. Deposited.  
 26. 1 Spotted Ichneumon (*Herpestes auro-punctatus*). Received in exchange.  
 1 Common Kestrel (*Tinnunculus alaudarius*). Presented by Mr. A. Lidbury.  
 1 Common Snake (*Tropidonotus natrix*). Presented by H. Dawson, Esq.  
 28. 1 Tawny Eagle (*Aquila naevioides*). Presented by Mr. — Southey of Cape-town.  
 30. 1 Red-faced-Spider Monkey (*Ateles paniscus*). Purchased.  
 3 Red-billed Tree-Ducks (*Dendrocygna autumnalis*). Purchased.  
 1 Vinaceous Amazon (*Chrysotis vinacea*). Purchased. See P. Z. S. 1881, p. 968.  
 1 Carrion-Crow (*Corvus corone*). Presented by F. H. Worsley Benison, Esq.  
 1 Grey-breasted Parrakeet (*Bolborhynchus monachus*). Presented by J. Lloyd, Esq.  
 1 Black-headed Conure (*Conurus nanday*). Presented by J. Lloyd, Esq.
- Dec. 1. 1 Black-eared Marmoset (*Hapale penicillata*). Presented by Mrs. George Willins.  
 1 Geoffroy's Dove (*Peristera geoffroyi*), ♀. Bred in the Gardens.  
 1 Redshank (*Totanus calidris*). Purchased.  
 2 Dunlins (*Tringa cinclus*). Purchased.  
 1 Grey Plover (*Squatarola helvetica*). Purchased.  
 2 Razorbills (*Alca torda*). Purchased.  
 1 Curlew (*Numenius arquatus*). Purchased.  
 3. 2 Talpacoti Ground-Doves (*Chamaepelia talpacoti*), ♂ and ♀. Presented by Dr. A. Stradling, C.M.Z.S.  
 1 Plumbeous Snake (*Oxyrrhopus plumbeus*). Presented by Dr. A. Stradling, C.M.Z.S.  
 2 Talpacoti Lizards (*Taraguira smithi*). Presented by Dr. A. Stradling, C.M.Z.S.  
 1 Orange-flanked Tree-Frog (*Phyllomedusa hypochondrialis*). Presented by Dr. A. Stradling, C.M.Z.S.  
 5. 2 Cape Crowned Cranes (*Baleurica chrysopelargus*). Deposited.

- Dec. 5. 1 Mocassin Snake (*Tropidonotus fasciatus*). Born in the Gardens.
6. 1 Horrid Rattlesnake (*Crotalus horridus*). Presented by Dr. A. Stradling, C.M.Z.S.  
1 Giant Toad (*Bufo aqua*). Deposited.
7. 1 Pomatorhine Skua (*Stercorarius pomatorhinus*). Presented by Mr. G. H. Baxter.
9. 2 Common Kestrels (*Tinnunculus alaudarius*). Presented by F. Usher, Esq.  
1 Common Tench (*Tinca vulgaris*). Presented by F. Usher, Esq.
10. 1 Red Kangaroo (*Macropus rufus*), ♂. Born in the Gardens.  
1 Common Jay (*Garrulus glandarius*). Presented by J. Young, Esq.  
1 Dwarf Chameleon (*Chamæleon pumilus*). Presented by Major Hunt.
12. 1 Green Monkey (*Cercopithecus callitrichus*). Deposited.  
2 Squirrel Monkeys (*Chrysothrix sciurea*). Presented by F. N. Aphorp, Esq.  
4 Snow-Buntings (*Plectrophanes nivalis*), 2 ♂ and 2 ♀. Purchased.
13. 2 Common Siskins (*Chrysomitris spinus*), ♂ and ♀. Purchased.
14. 2 Ferrets (*Mustela furo*). Presented by Mrs. J. F. Faed.
15. 1 Mona Monkey (*Cercopithecus mona*). Deposited.  
1 Black-backed Jackal (*Canis mesomelas*). Presented by Capt. C. Holled Smith.  
1 Bosch-bok (*Tragelaphus sylvaticus*). Presented by E. W. Berryman, Esq.  
1 Rose-coloured Pastor (*Pastor roseus*). Presented by F. Lubbock, Esq.  
6 Dwarf Chameleons (*Chamæleon pumilus*). Presented by Col. Hassard, R.E.
16. 1 Chacma Baboon (*Cynocephalus porcarus*), ♀. Presented by Capt. Wyld.  
1 Herring-Gull (*Larus argentatus*). Presented by E. W. Ebsworth, Esq.  
1 Greater Black-backed Gull (*Larus marinus*). Presented by E. W. Ebsworth, Esq.  
1 Cerastes Viper (*Vipera cerastes*). Deposited.
20. 1 Black-throated Diver (*Colymbus arcticus*). Purchased.  
2 Oyster-catchers (*Hæmatopus ostralegus*). Purchased.
21. 1 Rhesus Monkey (*Macacus erythræus*), ♀. Deposited.  
1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♀. Presented by C. A. Rose, Esq.
22. 1 Guemul Deer (*Furcifer chilensis*), ♂. Purchased. See P. Z. S. 1882, p. 97.  
4 Undulated Grass-Parrakeets (*Melopsittacus undulatus*). Bred in the Gardens.  
1 Common Kite (*Milvus ictinus*). Presented by G. H. Tod-Heatley, Esq.
24. 1 Germain's Peacock Pheasant (*Polyplectron germaini*), ♂. Purchased. See P. Z. S. 1882, p. 97.  
1 Javan Parrakeet (*Palæornis javanicus*). Purchased.  
1 White-browed Amazon (*Chrysotis albifrons*). Purchased.  
1 White-headed Parrot (*Pionus senilis*). Purchased.  
2 Chestnut-breasted Ducks (*Anas castanea*), ♂ and ♀. Purchased.  
1 Chilian Teal (*Querquedula creccoides*), ♂. Presented by Mons. J. M. Cornély.

- Dec. 24. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.
23. 1 Short-toed Lark (*Calandrella brachydactyla*). Presented by H. A. Macpherson, Esq.
25. 1 Pike (*Esox lucius*). Presented by George Seaton, Esq.  
 1 Kuhlmanse (*Crossarchus obscurus*). Purchased.  
 1 Blue-crowned Parrot (*Tanygnathus luzonensis*). Purchased.  
 1 White-eared Conure (*Conurus leucotis*). Purchased.
29. 1 Rhesus Monkey (*Macacus erythraus*), ♀. Presented by Mr. Wm. Trent.  
 1 Black-footed Penguin (*Spheniscus demersus*). Presented by Capt. H. H. Stockham.
30. 1 Marsh-Ichneumon (*Herpestes paludosus*, rufous var.). Presented by Ernest Wells, Esq.
- 1 Molucca Deer (*Cervus moluccensis*), ♀. Bred in the Gardens.
31. 1 Kinkajou (*Cereuleptes cardivolvulus*). Deposited.  
 1 Indranee Owl (*Syrnium indranee*). Presented by Commander Burkitt.



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